

## ภาคผนวก ค.3

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ผลการศึกษาและสำรวจสภาพเศรษฐกิจ-สังคม และความคิดเห็นต่อโรงไฟฟ้า

ประจำปี 2567

โรงไฟฟ้าแก่งคอย 2 บริษัท แก่งคอย เพาเวอร์ เจเนอเรชั่น จำกัด

## รายงานสรุปผลการสำรวจความคิดเห็นของประชาชนต่อ โครงการโรงไฟฟ้าแก่งคอย 2 บริษัท แก่งคอย เพาเวอร์ เจเนอเรชั่น จำกัด

### 1. ความเป็นมา

โครงการโรงไฟฟ้าแก่งคอย 2 จังหวัดสระบุรี ของบริษัท แก่งคอย เพาเวอร์ เจเนอเรชั่น จำกัด ที่ตั้ง ตำบลบ้านป่า อำเภอแก่งคอย จังหวัดสระบุรี ได้นำเสนอรายงานการวิเคราะห์ผลกระทบสิ่งแวดล้อมต่อสำนักงานนโยบายและแผนทรัพยากรธรรมชาติและสิ่งแวดล้อม (สผ.) ซึ่งได้รับความเห็นชอบในรายงานการวิเคราะห์ผลกระทบสิ่งแวดล้อม โดยโครงการต้องปฏิบัติตามมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม ซึ่งได้กำหนดให้มีการสำรวจสภาพเศรษฐกิจ สังคมและความคิดเห็นของครัวเรือน ผู้นำท้องถิ่น โดยรอบโครงการ เพื่อให้ทราบถึงความคิดเห็นที่มีต่อโครงการ ทั้งในเรื่องของผลกระทบที่อาจเกิดขึ้นจากโครงการ รวมถึงข้อเสนอแนะต่างๆ ครอบคลุมกับตำแหน่งที่ทำการตรวจวัดคุณภาพสิ่งแวดล้อม ภายในรัศมี 5 กิโลเมตรรอบที่ตั้งโครงการ 2 ปี ต่อ 1 ครั้ง

ทั้งนี้ในระหว่างการจัดทำรายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อม และมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม โครงการได้ดำเนินการสำรวจสภาพเศรษฐกิจ สังคมและความคิดเห็นของครัวเรือน ผู้นำท้องถิ่น ซึ่งดำเนินการระหว่างวันที่ 10 - 11 ตุลาคม พ.ศ. 2567 มีรายละเอียดการดำเนินงานดังนี้

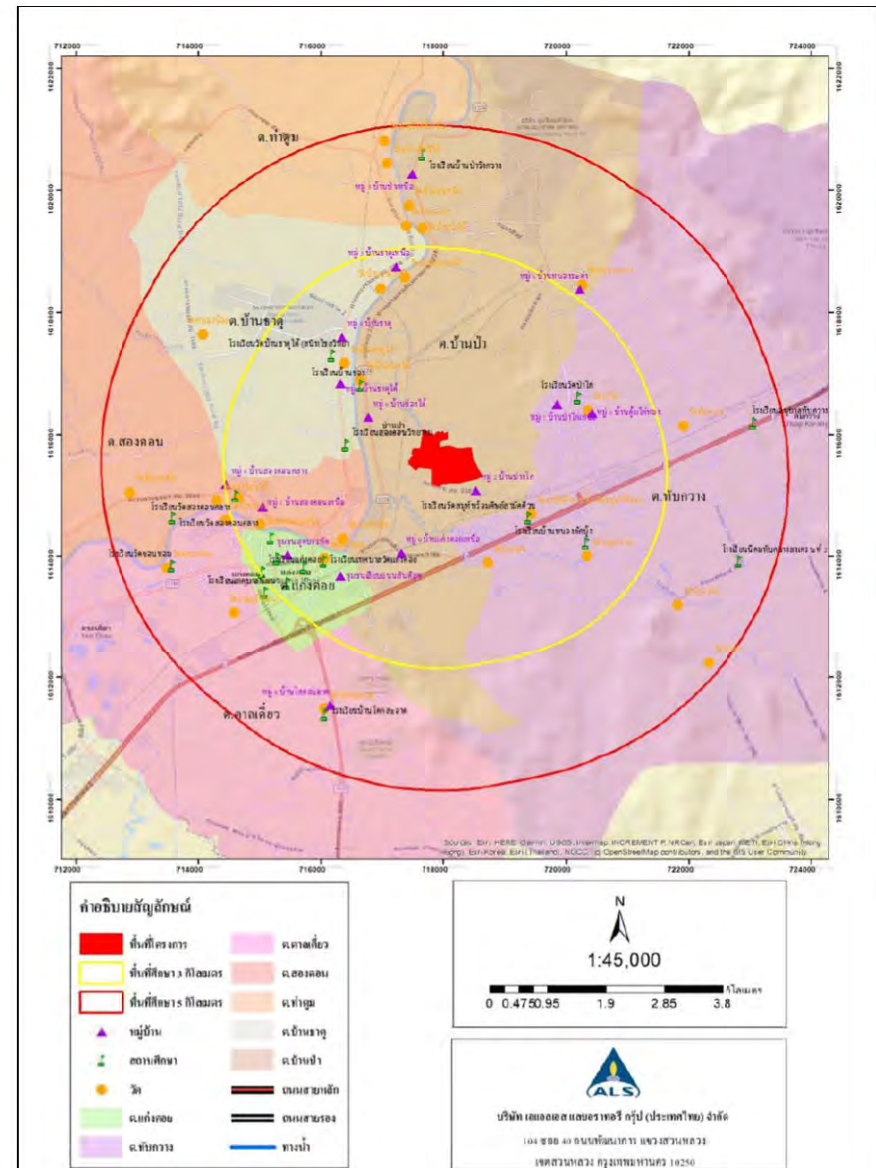
### 2. วัตถุประสงค์

การสำรวจสภาพสังคม-เศรษฐกิจ และความคิดเห็นต่อการดำเนินโครงการโรงไฟฟ้าแก่งคอย 2 ของบริษัท แก่งคอย เพาเวอร์ เจเนอเรชั่น จำกัด เพื่อรับฟังข้อคิดเห็น/ข้อเสนอแนะ/ข้อกังวลใจของประชาชน และผู้นำท้องถิ่น ในช่วงดำเนินการที่ผ่านมาของโครงการ โดยมีวัตถุประสงค์ดังนี้

- (1) เพื่อศึกษาสภาพสังคม-เศรษฐกิจ ได้แก่ การประกอบอาชีพ สุขอนามัย ระบบสาธารณสุข และสภาพความเป็นอยู่ของประชาชน รวมทั้ง เพื่อรับทราบสภาพปัญหาเกี่ยวกับสภาพแวดล้อมที่ส่งผลกระทบต่อการใช้ชีวิตของประชาชนในปัจจุบัน
- (2) เพื่อศึกษาการรับรู้ข้อมูลข่าวสาร ความต้องการรับทราบข้อมูลข่าวสารของโครงการ รวมทั้งความคิดเห็นและความพึงพอใจต่อการดำเนินงานในด้านต่างๆ ของโครงการ
- (3) เพื่อรับฟังความคิดเห็นต่างๆ ต่อการดำเนินการที่ผ่านมาของโครงการร่วมกับชุมชน พร้อมทั้งรับฟังความคิดเห็น ข้อเสนอแนะต่อการดำเนินการ และการดำเนินกิจกรรมต่างๆ ร่วมกับชุมชน
- (4) เพื่อนำข้อมูลการสำรวจความคิดเห็นประกอบการนำเสนอไว้ในรายงานผลการปฏิบัติตามมาตรการด้านสิ่งแวดล้อมของโครงการ ต่อสำนักงานนโยบายและแผนทรัพยากรธรรมชาติและสิ่งแวดล้อม รวมทั้งรวบรวมข้อมูลที่ได้สำหรับการประกอบการดำเนินกิจกรรมด้านต่างๆ ของโครงการต่อไป

### 3. พื้นที่ดำเนินการศึกษา

พื้นที่ศึกษากำหนดจากที่ตั้งโครงการ ภายในรัศมี 5 กิโลเมตร แสดงดังรูปที่ 1 ครอบคลุมพื้นที่จำนวน 17 ชุมชน ในเขตการปกครอง 4 องค์การบริหารส่วนตำบล และ 2 เทศบาลตำบล อำเภอแก่งคอย จังหวัดสระบุรี รายละเอียดดังนี้



รูปที่ 1 พื้นที่ศึกษาในการสำรวจความคิดเห็นต่อการดำเนินโครงการ รัศมี 5 กิโลเมตรรอบที่ตั้งโครงการ



- 1) เทศบาลเมืองแก่งคอย จำนวน 2 ชุมชน ประกอบด้วย
  - ชุมชนเลียบถนนสันติสุข
  - ชุมชนสุดบรรทัด
- 2) เทศบาลเมืองทับทิว (ตำบลทับทิว) จำนวน 2 ชุมชน ประกอบด้วย
  - หมู่ที่ 7 บ้านป่าไผ่เหนือ
  - หมู่ที่ 8 บ้านคุ้มไผ่ทอง
- 3) องค์การบริหารส่วนตำบลลาดเดี่ยว จำนวน 1 ชุมชน ประกอบด้วย
  - หมู่ที่ 8 บ้านโคกสะอาด
- 4) องค์การบริหารส่วนท่าตูม (ตำบลบ้านธาตุ) จำนวน 3 ชุมชน ประกอบด้วย
  - หมู่ที่ 1 บ้านธาตุใต้
  - หมู่ที่ 3 บ้านธาตุเหนือ
  - หมู่ที่ 4 บ้านเดื่อ
  - หมู่ที่ 5 บ้านธาตุ
- 5) องค์การบริหารส่วนตำบลบ้านป่า จำนวน 5 ชุมชน ประกอบด้วย
  - หมู่ที่ 2 บ้านปางโก
  - หมู่ที่ 3 บ้านป่าเหนือ
  - หมู่ที่ 6 บ้านหนองมะค่า
  - หมู่ที่ 8 บ้านช่องไธ
  - หมู่ที่ 9 บ้านแก่งคอยเหนือ
- 6) องค์การบริหารส่วนตำบลสองคอน จำนวน 2 ชุมชน ประกอบด้วย
  - หมู่ที่ 1 สองคอนเหนือ
  - หมู่ที่ 4 สองคอนกลาง

#### 4. วิธีการศึกษา

การกำหนดลักษณะของกลุ่มตัวอย่างที่ดีซึ่งมีสองประการหลักด้วยกัน คือกลุ่มตัวอย่างต้องเป็นตัวแทนที่ดีของประชากรในพื้นที่ศึกษาและกลุ่มตัวอย่างต้องมีขนาดเหมาะสมพอเพียงในการคัดเลือกตัวแทนที่ดีของประชากรนั้นการวางแผนคัดเลือกกลุ่มตัวอย่างเริ่มต้นโดยการสำรวจพื้นที่เป้าหมายก่อนเพื่อศึกษาภาพรวมลักษณะการรวมตัวของประชากร ซึ่งพบว่าชุมชนที่อยู่ในพื้นที่ศึกษามีลักษณะการรวมตัวของประชากรที่คล้ายคลึงกัน ไม่แตกต่างกันมากนัก ได้แก่ เพศ อายุ การศึกษา และรายได้ เช่น ความรู้ ความคิดเห็นและความพึงพอใจ เป็นต้นส่วนใหญ่มีการตั้งครัวเรือนรวมตัวกันเป็นกลุ่มอยู่ตามแนวถนน บริษัทที่ปรึกษาได้สำรวจความคิดเห็นของประชาชนในพื้นที่ศึกษาในระดับครัวเรือน โดยดำเนินการสำรวจความคิดเห็นรายครัวเรือน ดำเนินการระหว่างวันที่ 10 - 11 ตุลาคม พ.ศ. 2567 โดยใช้แบบสอบถามเป็นเครื่องมือในการเก็บรวบรวมข้อมูลในด้านต่างๆ ทั้งนี้เพื่อให้การสำรวจครอบคลุมจึงกำหนดกลุ่มตัวอย่างที่สำรวจแบ่งเป็น 2 กลุ่ม ได้แก่



ซึ่งวิธีการสำรวจข้อมูล และการกำหนดจำนวนตัวอย่าง อธิบายได้ดังนี้

##### 1) กำหนดจำนวนตัวอย่างและการสุ่มตัวอย่าง

การกำหนดตัวอย่างและการสุ่มตัวอย่าง คือ การเลือกกลุ่มตัวแทนประชากรจากจำนวนประชากรทั้งหมด โดยใช้วิธีการศึกษาด้านประชากรศาสตร์ เพื่อนำข้อมูลมาวิเคราะห์ซึ่งข้อมูลเหล่านี้จะสะท้อนภาพความคิดเห็นของประชากร โดยคำนึงถึงการครอบคลุมของพื้นที่ศึกษาทั้งหมด ซึ่งพบว่าจำนวนประชากรที่สุ่มมาเป็นตัวอย่างมีสภาพทางสังคมที่คล้ายคลึงกัน ไม่แตกต่างกันมากนัก การศึกษาครั้งนี้จึงกำหนดกลุ่มตัวอย่างประกอบด้วย ผู้นำชุมชน และตัวแทนครัวเรือน คือ

##### 1) ผู้นำชุมชน

การสำรวจความคิดเห็นผู้นำชุมชนใช้การเลือกตัวอย่างแบบเจาะจง (Purposive Sampling) เช่นเดียวกับหน่วยงานที่เกี่ยวข้อง ซึ่งกำหนดเป็นผู้นำชุมชนที่มีบทบาทหน้าที่ทางสังคมที่ได้รับการยอมรับจากชุมชน และสามารถให้ข้อมูลที่สะท้อนความคิดเห็นในภาพรวมของชุมชนได้ ซึ่งการศึกษาความคิดเห็นของชุมชนในครั้งนี้ เป็นการสุ่มตัวอย่างจากกลุ่มเป้าหมายประกอบด้วย กำนัน สารวัตรกำนัน ประธานชุมชน ผู้ใหญ่บ้าน ผู้ช่วยผู้ใหญ่บ้าน เลขานุการกรรมการชุมชน และเหรัญญิก ที่อยู่ในบริเวณพื้นที่ศึกษาของโครงการ

##### 2) ครัวเรือน

การสำรวจความคิดเห็นประชาชนได้ทำการเก็บตัวอย่างชุมชนที่อยู่ในรัศมีพื้นที่ศึกษา 5 กิโลเมตรรอบที่ตั้งโครงการ โดยได้ทำการสุ่มให้กระจายครอบคลุมบริเวณพื้นที่ศึกษา และบริเวณที่มีการติดตั้งจุดตรวจวัดคุณภาพสิ่งแวดล้อมของโครงการ ทำการสัมภาษณ์ครัวเรือนละ 1 ตัวอย่างเท่านั้น

• การกำหนดขนาดของกลุ่มตัวอย่าง การสุ่มตัวอย่างระดับประชาชนในการสำรวจในครั้งนี้ได้ทำการกำหนดกลุ่มตัวอย่างโดยใช้สูตรของ Taro Yamane เนื่องจากเป็นสูตรที่ใช้คำนวณขนาดของกลุ่มตัวอย่างในกรณีที่ทราบจำนวนประชากรแน่นอน (จิตราภา กุลชลบุตร, 2550, Yamane, T. 1973: 1088) ดังนี้



$$n = \frac{N}{1 + Ne^2} \quad \text{----- (1)}$$

โดยที่ n คือ จำนวนตัวอย่าง  
N คือ จำนวนหน่วยครัวเรือนในพื้นที่ศึกษา  
e คือ ความคลาดเคลื่อนที่ยอมรับได้ (ร้อยละ 5)

ในที่นี้กำหนดระดับความเชื่อมั่นร้อยละ 95 หรือมีค่าความคลาดเคลื่อนเท่ากับ  $\pm 0.05$  เมื่อคำนวณจำนวนตัวอย่างโดยใช้สูตรของ Taro Yamane จากจำนวนครัวเรือนที่อยู่ในพื้นที่ที่อาศัยอยู่โดยรอบโครงการฯ ภายในพื้นที่รัศมี 5 กิโลเมตร จากที่ตั้งโครงการฯ

จำนวนครัวเรือนในบริเวณพื้นที่ศึกษารัศมี 5 กิโลเมตร มีจำนวนครัวเรือนทั้งหมด 9,163 ครัวเรือน สามารถแทนค่าในสูตรดังสมการ (1) ได้ดังนี้

$$n = \frac{9,163}{1 + (9,163 \times (0.05)^2)}$$

$$n = 383.27$$

$$n \approx 384 \text{ ตัวอย่าง}$$

ดังนั้น ขนาดของกลุ่มตัวอย่างที่ทำการสำรวจต้องไม่น้อยกว่า 384 ตัวอย่าง

เมื่อคำนวณจำนวนตัวอย่างโดยใช้สมการที่ (1) จะนำมากระจายตามสัดส่วนของประชากรแต่ละชุมชนในพื้นที่ศึกษา เพื่อให้ทุกหน่วยของประชากรมีโอกาสถูกเลือกเท่าๆ กันดังสมการที่ (2)

$$A = \frac{n_1 n}{N} \quad \text{----- (2)}$$

เมื่อ  $n_1$  คือ จำนวนครัวเรือนของชุมชนหรือหมู่บ้าน  
N คือ จำนวนครัวเรือนทั้งหมด  
n คือ จำนวนตัวอย่างทั้งหมดจากสมการ (1)  
A คือ จำนวนตัวอย่างของแต่ละหมู่บ้าน/ชุมชน

$$\text{ยกตัวอย่างเช่น : หมู่ที่ 2 บ้านปางโก} = \frac{676 \times 384}{9,163} \approx 28.33$$

สัดส่วนระหว่างจำนวนตัวอย่างกับจำนวนครัวเรือนแต่ละกลุ่มตัวอย่างในการสำรวจต้องไม่น้อยกว่า 384 ตัวอย่าง ซึ่งที่ปรึกษาได้ดำเนินการสำรวจจริงทั้งสิ้น 392 ตัวอย่าง โดยสัดส่วนตัวอย่างทั้งหมดกับจำนวนครัวเรือนในแต่ละชุมชน แสดงดังตารางที่ 1

ตารางที่ 1 จำนวนตัวอย่างในการสำรวจสภาพเศรษฐกิจ-สังคม และความคิดเห็นต่อการดำเนินโครงการ

ลำดับ	เขตการปกครอง	ชุมชน/หมู่บ้าน	จำนวนครัวเรือน <sup>1/</sup>	จำนวน (ตัวอย่าง)	
				จากการคำนวณ	เก็บจริง
1	เทศบาลเมืองแก่งคอย	ชุมชนเลี้ยวถนนสันติสุข	332	13.9	14
2		ชุมชนสุดบรรทัด	365	15.3	16
3	เทศบาลเมืองทับกวาง (ตำบลทับกวาง)	หมู่ที่ 7 บ้านป่าไผ่เหนือ	1,564	65.5	66
4		หมู่ที่ 8 บ้านคุ้มไม้ทอง	659	27.6	28
5	องค์การบริหารส่วนตำบลตาลเดี่ยว	หมู่ที่ 8 บ้านโคกสะอาด	681	28.5	29
6	องค์การบริหารส่วนตำบลท่าตูม (ตำบลบ้านธาตุ)	หมู่ที่ 1 บ้านธาตุใต้	309	12.9	13
7		หมู่ที่ 2 ท่ากะเบา	118	4.9	5
8		หมู่ที่ 3 บ้านธาตุเหนือ	88	3.7	4
9		หมู่ที่ 4 บ้านเคือ	89	3.7	4
10		หมู่ที่ 5 ธาตุใต้	157	6.6	7
11	องค์การบริหารส่วนตำบลบ้านป่า	หมู่ที่ 2 บ้านปางโก	676	28.3	29
12		หมู่ที่ 3 บ้านป่าเหนือ	195	8.2	9
13		หมู่ที่ 6 บ้านหนองมะค่า	836	35.0	36
14		หมู่ที่ 8 บ้านช่องไค้	441	18.5	19
15		หมู่ที่ 9 บ้านแก่งคอยเหนือ	1,294	54.2	55
16	องค์การบริหารส่วนตำบลสองคอน	หมู่ที่ 1 สองคอนเหนือ	1,178	49.4	50
17		หมู่ที่ 4 สองคอนกลาง	181	7.6	8
รวม			9,163	384	392

หมายเหตุ : 1/กรมการปกครอง กระทรวงมหาดไทย, 2566 สืบค้นข้อมูลเมื่อเดือนสิงหาคม 2567

ที่มา : รวบรวมโดยบริษัท เอแอลเอส แลบริทอรี่ กรุ๊ป (ประเทศไทย) จำกัด, 2567

## (2) วิธีการเก็บตัวอย่างข้อมูลแบบสอบถามในภาคสนาม

การสำรวจด้านสภาพเศรษฐกิจและสังคม และความคิดเห็น ได้ดำเนินการระหว่างวันที่ 10 - 11 ตุลาคม พ.ศ. 2567 ทั้งนี้ มีการเตรียมความพร้อมในส่วนของพนักงานสัมภาษณ์ภาคสนาม โดยที่ปรึกษาได้ทำการชี้แจงรายละเอียดของแบบสอบถาม วัตถุประสงค์และเป้าหมายในการสำรวจ ตลอดจนรายละเอียดเกี่ยวกับโครงการฯ ให้มีความรู้และความเข้าใจโครงการ ในระดับที่สามารถให้ข้อมูลเบื้องต้นแก่ผู้ให้สัมภาษณ์ได้ อย่างไรก็ตาม การเก็บข้อมูลของพนักงานสัมภาษณ์ได้ดำเนินการภายใต้การควบคุมดูแลของผู้มีประสบการณ์ภาคสนามซึ่งทำหน้าที่ตรวจสอบ เพื่อให้ข้อมูลมีความถูกต้องและสมบูรณ์เพียงพอที่จะนำมาแปลผล โดยการสำรวจความคิดเห็นภาคสนามจากกลุ่มตัวอย่างครัวเรือนในแต่ละชุมชนในพื้นที่ศึกษา ครั้งนี้ ได้เลือกกลุ่มตัวอย่างครัวเรือนเพื่อเป็นตัวแทนศึกษา โดยใช้การเลือกกลุ่มตัวอย่างแบบการสุ่มตัวอย่างโดยอาศัยหลักความน่าจะเป็น (Probability Sampling) และใช้วิธีการสุ่มตัวอย่างแบบเป็นระบบ (Systematic Random Sampling) ซึ่งจะกระจายการสุ่มตัวอย่างตามสัดส่วนครัวเรือนที่อาศัยอยู่ในแต่ละพื้นที่ให้ครอบคลุมตำบลในพื้นที่ศึกษา โดยมีขั้นตอนดังนี้



ขั้นตอนที่ 1: จำแนกครัวเรือนที่อาศัยอยู่โดยรอบโครงการ ภายในพื้นที่ศึกษาจากที่ตั้งโครงการ

ขั้นตอนที่ 2: ทำการสุ่มตัวอย่างครัวเรือนรายตำบล โดยทำการเก็บรวบรวมข้อมูลจากผู้แทนครัวเรือนครัวเรือนละ 1 ราย โดยคำนึงถึงการกระจายของกลุ่มตัวอย่างให้สม่ำเสมอ จากนั้นจะทำการเก็บรวบรวมข้อมูลให้ได้ขนาดของจำนวนตัวอย่างครัวเรือนในแต่ละตำบลตามสัดส่วนจำนวนประชากร โดยมีวิธีการดังนี้

(ก) การสุ่มตัวอย่างครัวเรือนจะต้องสุ่มตัวอย่างครัวเรือนในตำบลที่ได้กำหนดไว้ และจำนวนตัวอย่างขั้นต่ำต้องเป็นไปตามที่ได้คำนวณตามสัดส่วนของชุมชนนั้นๆ

(ข) การเลือกพื้นที่เป้าหมายเบื้องต้นเพื่อสุ่มตัวอย่าง จะเลือกพื้นที่ที่มีจำนวนครัวเรือนหนาแน่นเป็นหลัก โดยพิจารณาจากแผนที่และการสำรวจเบื้องต้น และกำหนดให้สุ่มตัวอย่างกระจายอย่างทั่วถึงในพื้นที่นั้นๆ หากชุมชนที่ทำการสำรวจมีพื้นที่ที่มีจำนวนครัวเรือนหนาแน่นอื่นๆ จะทำการสำรวจให้ครอบคลุมทุกๆ พื้นที่ในชุมชนนั้นๆ ด้วยเพื่อให้เกิดการกระจายของตัวอย่างและให้เป็นตัวแทนที่ครอบคลุมทั้งตำบล

(ค) การเลือกครัวเรือนเป้าหมายเพื่อสุ่มตัวอย่าง จะไม่กำหนดว่าจะเป็นหน่วยใด หรือครัวเรือนใด ทุกๆ ครัวเรือนมีโอกาสที่จะถูกเลือกเช่นเดียวกัน แต่จะสุ่มตัวอย่างตามความเหมาะสมของสถานการณ์ที่เกิดขึ้นในการสำรวจ เช่น ร้านค้า หรือบ้านเรือนที่สะดวกให้เข้าสัมภาษณ์และยินดีที่จะให้ความคิดเห็น แต่มีข้อจำกัดเบื้องต้นในการสุ่มตัวอย่าง โดยจะต้องทำการสุ่มตัวอย่างให้ครอบคลุมทั้งพื้นที่เป้าหมาย และต้องไม่มีการเลือกตัวอย่างจากความรู้สึกและอคติส่วนตัว (Bias) เช่น การเลือกสุ่มตัวอย่างเพื่อทำการสัมภาษณ์เฉพาะเพศชายหรือช่วงอายุใดอายุหนึ่ง เป็นต้น

(ง) การตรวจสอบตัวอย่างครัวเรือนเป้าหมายเบื้องต้น เพื่อให้เป็นตัวแทนที่ดีของกลุ่มตัวอย่างครัวเรือน จะกำหนดให้พนักงานสัมภาษณ์สอบถามผู้ให้สัมภาษณ์ว่าเป็นผู้ที่อยู่อาศัยในพื้นที่เป้าหมายหรือไม่ หากเป็นผู้ที่อาศัยในพื้นที่จริงจะดำเนินการสัมภาษณ์ในขั้นตอนต่อไป

### (3) เครื่องมือที่ใช้ในการสำรวจสภาพสังคม-เศรษฐกิจ

การสำรวจด้านสภาพเศรษฐกิจ และสังคมในแต่ละชุมชนใช้วิธีการเข้าพบเป็นรายครัวเรือนโดยใช้แบบสัมภาษณ์เป็นเครื่องมือ ทั้งนี้ แบบสัมภาษณ์ที่ใช้เป็นแบบสัมภาษณ์แบบมีโครงสร้าง คำถามมีลักษณะเป็นคำถามปลายปิดและคำถามปลายเปิด โดยแบ่งแบบสอบถามออกเป็น 2 ประเภท คือ ผู้นำชุมชน และครัวเรือน แสดงดังเอกสารแนบ 1 มีรายละเอียดดังนี้

#### 1) แบบสัมภาษณ์สำหรับผู้นำชุมชน

- ข้อมูลทั่วไปของผู้ให้สัมภาษณ์
- สภาพเศรษฐกิจ สังคมของชุมชน
- ข้อมูลด้านสาธารณสุขและสาธารณูปโภคชุมชนของท่าน
- ข้อมูลด้านสภาพแวดล้อมในปัจจุบันของชุมชน
- การรับทราบข้อมูล/ข่าวสาร และการมีส่วนร่วมกิจกรรมของโรงไฟฟ้า
- ผลกระทบและทัศนคติต่อการดำเนินงานของโรงไฟฟ้า
- ความเชื่อมั่น และความคิดเห็นต่อโรงไฟฟ้า

#### 2) แบบสัมภาษณ์สำหรับครัวเรือน

- ข้อมูลทั่วไปของผู้ให้สัมภาษณ์
- ข้อมูลด้านสภาพเศรษฐกิจของครัวเรือน
- ข้อมูลด้านสุขภาพอนามัยและสาธารณูปโภค
- ข้อมูลด้านสภาพแวดล้อมในปัจจุบันของชุมชน
- การรับทราบข้อมูล/ข่าวสาร และการมีส่วนร่วมกิจกรรมของโรงไฟฟ้า
- ผลกระทบและทัศนคติต่อการดำเนินงานของโรงไฟฟ้า
- ความเชื่อมั่น และความคิดเห็นต่อโรงไฟฟ้า

### 5. การวิเคราะห์ข้อมูล

ข้อมูลที่ได้จากการสัมภาษณ์โดยใช้แบบสอบถาม จะถูกนำมาวิเคราะห์ และประมวลผลการศึกษา โดยการวิเคราะห์ข้อมูลจะใช้โปรแกรมสำเร็จรูปทางสถิติ (Statistics Package for the Social Sciences) ซึ่งมีขั้นตอนโดยจัดเตรียมคู่มือการลงรหัสเพื่อเปลี่ยนข้อมูลจากแบบสอบถามเป็นรหัสสำหรับการบันทึกข้อมูล ก่อนที่จะทำการลงรหัสนั้นได้ทำการตรวจสอบความถูกต้องของข้อมูลแบบสอบถาม จากนั้นทำการแปลผล และจัดทำตารางแสดงข้อมูลเป็นรูปแบบตารางแจกแจงความถี่ ร้อยละ และค่าเฉลี่ย โดยนำเสนอผลการสำรวจความคิดเห็นแยกเป็นระดับกลุ่มผู้นำชุมชน และกลุ่มครัวเรือน พร้อมทั้งบรรยายสรุปผลการสำรวจความคิดเห็นเป็นร้อยละ แยกตามกลุ่มเป้าหมายตามที่กล่าวข้างต้น

### 6. การแปลผลข้อมูล

#### 1) การแปลผลโดยใช้คำร้อยละ

วิธีการโดยหาความถี่ (จำนวน) ในแต่ละคำตอบ แล้วแปลความถี่เหล่านั้นให้อยู่ในรูปร้อยละ ข้อมูลที่ใช้การวิเคราะห์ลักษณะนี้เป็นแบบสอบถามปลายปิด มีลักษณะให้เลือกตอบ

#### 2) การแปลผลแบบมาตราส่วนประมาณค่า

คำถามเพื่อต้องการทราบความคิดเห็นที่มีลักษณะคำถามเป็นแบบมาตราส่วนประมาณค่าของลิเคิร์ท (Likert Scale) และใช้การวัดข้อมูลประเภทอันตรภาคชั้น (Interval Scale) ได้ทำการหาค่าเฉลี่ยคะแนนความคิดเห็น โดยกำหนดคะแนนน้ำหนักให้แต่ละช่วงของระดับความคิดเห็นแล้วคำนวณค่าเฉลี่ย จากนั้นนำค่าเฉลี่ยที่ได้ไปเทียบกับเกณฑ์การแปลความหมาย ซึ่งการหาค่าเฉลี่ยโดยทั่วไปจะใช้ผลรวมของ ผลคูณระหว่างค่าน้ำหนักของแต่ละระดับกับค่าความถี่ในระดับนั้น แล้วหารด้วยความถี่ทั้งหมด ซึ่งการแปลความหมายคะแนนเฉลี่ยในแต่ละระดับใช้เกณฑ์ในการแปลความหมายคะแนนตามเกณฑ์ของเบสท์ (Best 1981:179-187) โดยมีหลักเกณฑ์การให้คะแนน ดังนี้

การประเมินระดับความพึงพอใจ มีเกณฑ์การให้คะแนน ดังนี้

ระดับมากที่สุด	ให้	5	คะแนน
ระดับมาก	ให้	4	คะแนน
ระดับปานกลาง	ให้	3	คะแนน
ระดับน้อย	ให้	2	คะแนน
ระดับน้อยที่สุด	ให้	1	คะแนน



การแปลความหมายคะแนนเฉลี่ย ดังนี้

คะแนนเฉลี่ย 4.51 - 5.00	หมายถึง มากที่สุด
คะแนนเฉลี่ย 3.51 - 4.50	หมายถึง มาก
คะแนนเฉลี่ย 2.51 - 3.50	หมายถึง ปานกลาง
คะแนนเฉลี่ย 1.51 - 2.50	หมายถึง น้อย
คะแนนเฉลี่ย 1.00 - 1.50	หมายถึง น้อยที่สุด

#### 7. ผลการสำรวจสภาพเศรษฐกิจ-สังคม

ผลการศึกษาสภาพเศรษฐกิจ สังคม และความคิดเห็นรายครัวเรือน โดยทั่วไปของพื้นที่ศึกษาจากตัวแทนผู้นำชุมชน และตัวแทนประชาชน บรรยายภาพการสำรวจความคิดเห็น แสดงดังรูปที่ 2 และรูปที่ 3 สรุปผลการสำรวจความคิดเห็นได้ดังนี้

	
ผู้นำชุมชนหมู่ที่ 4 บ้านสองคลองกลาง องค์การบริหารส่วนตำบลสองคอน	ผู้นำชุมชนหมู่ที่ 8 บ้านโคกสะอาด องค์การบริหารส่วนตำบลลาดเดียว
	
ผู้นำชุมชนหมู่ที่ 8 บ้านช่องไต้ องค์การบริหารส่วนตำบลบ้านป่า	ผู้นำชุมชนหมู่ที่ 2 บ้านท่ากะเบา องค์การบริหารส่วนท่าตูม (บ้านธาตุ)
	
ผู้นำชุมชนหมู่ที่ 1 บ้านสองคอนเหนือ องค์การบริหารส่วนตำบลสองคอน	ผู้นำชุมชนหมู่ที่ 5 บ้านธาตุใต้ องค์การบริหารส่วนท่าตูม
รูปที่ 2 บรรยายภาพการสำรวจความคิดเห็นตัวแทนผู้นำชุมชนในรัศมี 5 กิโลเมตร	

	
ตัวแทนครัวเรือนหมู่ 4 บ้านสองคอนกลาง องค์การบริหารส่วนตำบลเขาสองคอน	ตัวแทนครัวเรือนหมู่ 6 บ้านหนองมะค่า องค์การบริหารส่วนตำบลบ้านป่า
	
ตัวแทนครัวเรือนหมู่ 3 บ้านธาตุเหนือ องค์การบริหารส่วนตำบลท่าตูม	ตัวแทนครัวเรือนหมู่ 8 บ้านคุ้มไม้ทอง เทศบาลเมืองทับกวาง
	
ตัวแทนครัวเรือนหมู่ 8 บ้านช่องไต้ องค์การบริหารส่วนตำบลบ้านป่า	ตัวแทนครัวเรือนชุมชนเลียบคลองสันติสุข เทศบาลเมืองแก่งคอย
	
ตัวแทนครัวเรือนชุมชนสุดบรรทัด เทศบาลเมืองแก่งคอย	ตัวแทนครัวเรือนหมู่ 9 บ้านแก่งคอยเหนือ องค์การบริหารส่วนตำบลบ้านป่า
รูปที่ 3 บรรยายภาพการสำรวจความคิดเห็นตัวแทนครัวเรือนในรัศมี 5 กิโลเมตร	



#### (1) ผลการสำรวจความคิดเห็นของกลุ่มผู้นำชุมชน

โครงการได้ทำการสัมภาษณ์ตัวแทนผู้นำชุมชน ในพื้นที่รัศมี 5 กิโลเมตรรอบที่ตั้งโครงการ ครอบคลุมพื้นที่ศึกษา 15 ชุมชน โดยได้สำรวจความคิดเห็นผู้นำชุมชนทั้งหมดจำนวน 30 ตัวอย่าง (แสดงรายละเอียดของกลุ่มตัวอย่าง ตารางที่ 6) และผลการสำรวจความคิดเห็น แสดงดังเอกสารแนบ 2 และสามารถสรุปรายละเอียดของผลการศึกษาได้ดังนี้

ตารางที่ 2 แสดงจำนวนตัวอย่างของกลุ่มผู้นำชุมชน

ลำดับ	ชื่อชุมชน/หมู่บ้าน	ตำแหน่ง	จำนวนตัวอย่าง
1	ชุมชนเลียบบนสันติสุข	ประธานชุมชน	1
		เลขาธิการชมรม	1
2	ชุมชนสุดบรรทัด	ประธานชุมชน	1
		เหรัญญิก	1
3	หมู่ที่ 7 บ้านป่าไผ่เหนือ	ผู้ใหญ่บ้าน	1
		ผู้ช่วยผู้ใหญ่บ้าน	1
4	หมู่ที่ 8 บ้านคุ้มไผ่ทอง	ผู้ใหญ่บ้าน	1
		ผู้ช่วยผู้ใหญ่บ้าน	1
5	หมู่ที่ 8 บ้านโคกสะอาด	ผู้ใหญ่บ้าน	1
		ผู้ช่วยผู้ใหญ่บ้าน	1
6	หมู่ที่ 1 บ้านธาตุใต้	ผู้ใหญ่บ้าน	1
		ผู้ช่วยผู้ใหญ่บ้าน	1
7	หมู่ที่ 2 ท่ากะเบา	กำนัน	1
		ผู้ช่วยกำนัน	1
8	หมู่ที่ 3 บ้านธาตุเหนือ	ผู้ใหญ่บ้าน	1
		ผู้ช่วยผู้ใหญ่บ้าน	1
9	หมู่ที่ 4 บ้านเคื่อ	ผู้ใหญ่บ้าน	1
		ผู้ช่วยผู้ใหญ่บ้าน	1
10	หมู่ที่ 5 ธาตุใต้	ผู้ใหญ่บ้าน	1
		ผู้ช่วยผู้ใหญ่บ้าน	1
11	หมู่ที่ 2 บ้านปางโก	ผู้ใหญ่บ้าน	1
		ผู้ช่วยผู้ใหญ่บ้าน	1

ตารางที่ 2 (ต่อ) แสดงจำนวนตัวอย่างของกลุ่มผู้นำชุมชน

ลำดับ	ชื่อชุมชน/หมู่บ้าน	ตำแหน่ง	จำนวนตัวอย่าง
12	หมู่ที่ 3 บ้านป่าเหนือ	ผู้ใหญ่บ้าน	1
		ผู้ช่วยผู้ใหญ่บ้าน	1
13	หมู่ที่ 6 บ้านหนองมะค่า	ผู้ใหญ่บ้าน	1
		ผู้ช่วยผู้ใหญ่บ้าน	1
14	หมู่ที่ 8 บ้านช่องไผ่	ผู้ใหญ่บ้าน	1
		ผู้ช่วยผู้ใหญ่บ้าน	1
15	หมู่ที่ 9 บ้านแก่งคอยเหนือ	ผู้ใหญ่บ้าน	1
		ผู้ช่วยผู้ใหญ่บ้าน	1
16	หมู่ที่ 1 สองคอนเหนือ	ผู้ใหญ่บ้าน	1
		ผู้ช่วยผู้ใหญ่บ้าน	1
17	หมู่ที่ 4 สองคอนกลาง	กำนัน	1
		สารวัตรกำนัน	1

ที่มา : รวบรวมโดยบริษัท เอแอลเอส แลבורาทอรี กรุ๊ป (ประเทศไทย) จำกัด, 2567

#### 1) ข้อมูลทั่วไป

ผู้นำชุมชนส่วนใหญ่เป็นเพศหญิง ร้อยละ 52.9 และเป็นเพศชาย ร้อยละ 47.1 ซึ่งผู้นำชุมชนส่วนใหญ่มีอายุอยู่ระหว่าง 51-60 ปี ร้อยละ 47.1 รองลงมาอายุอยู่ระหว่าง 41-50 ปี ร้อยละ 32.3 สำหรับการนับถือศาสนา ผู้นำชุมชนทั้งหมด นับถือศาสนาพุทธ ด้านการศึกษาพบว่าผู้นำชุมชนมีระดับการศึกษาอยู่ในระดับมัธยมศึกษาตอนปลาย (ม.6)/ปวช. หรือเทียบเท่า และการศึกษาในระดับปริญญาตรี ร้อยละ 23.5 สัดส่วนที่เท่ากัน รองลงมา มีการศึกษาในระดับอนุบาล/ปวส. หรือเทียบเท่า ร้อยละ 20.6 ซึ่งผู้นำชุมชนส่วนใหญ่ดำรงตำแหน่งเป็นผู้ใหญ่บ้าน และผู้ช่วยผู้ใหญ่บ้าน ร้อยละ 38.3 สัดส่วนที่เท่ากัน รองลงมาเป็นกำนัน และประธานชุมชน ร้อยละ 5.9 สัดส่วนที่เท่ากัน โดยมีระยะเวลาดำรงตำแหน่งอยู่ระหว่าง 1 -5 ปี ร้อยละ 58.8 รองลงมา มีระยะเวลาการดำรงตำแหน่งระหว่าง 11-15 ปี ร้อยละ 17.6 สำหรับภูมิสำเนาของผู้นำชุมชนส่วนใหญ่ ระบุว่า อยู่ในพื้นที่มาตั้งแต่เกิด ร้อยละ 82.4 รองลงมาย้ายมาจากภาคกลาง ร้อยละ 66.7 และระยะเวลาที่ย้ายมาส่วนใหญ่มากกว่า 20 ปีขึ้นไป ร้อยละ 83.3

#### 2) ข้อมูลด้านสภาพเศรษฐกิจ และสังคมของชุมชน

จากการสัมภาษณ์ผู้นำชุมชนเกี่ยวกับลักษณะทางสังคมของชุมชน พบว่าชุมชนมีจำนวนครัวเรือนในชุมชนส่วนใหญ่มากกว่า 600 หลังคาเรือน ร้อยละ 41.2 รองลงมาจำนวนครัวเรือนในชุมชนระหว่าง 100-200 หลังคาเรือน ร้อยละ 23.5 สำหรับจำนวนประชากรของคนในชุมชนส่วนใหญ่มากกว่า 2,000 คน ร้อยละ 35.3 รองลงมา มีจำนวนประชากรของคนในชุมชนอยู่ต่ำกว่า 500 คน และอยู่ระหว่าง 501-1,000 คน ร้อยละ 23.5 สัดส่วนที่เท่ากัน สำหรับภูมิสำเนาของประชาชนที่อยู่อาศัยในชุมชน ผู้นำชุมชนส่วนใหญ่ระบุว่าประชาชนในชุมชนเป็นคนในพื้นที่ ร้อยละ 76.5 รองลงมาเป็นคนนอกพื้นที่ ร้อยละ 23.5 โดยส่วนใหญ่ย้ายมาจากภาคตะวันออกเฉียงเหนือ ร้อยละ 87.5 รองลงมาย้ายมาจากภาคกลาง ร้อยละ 12.5



จากการสัมภาษณ์ผู้นำชุมชนเกี่ยวกับลักษณะทางเศรษฐกิจของชุมชน พบว่าการประกอบอาชีพหลักของประชาชนในชุมชนประกอบอาชีพพนักงานบริษัท/ พนักงานโรงงาน ร้อยละ 82.4 รองลงมาประกอบอาชีพค้าขาย/ธุรกิจส่วนตัว ร้อยละ 11.8 ทั้งนี้ผู้นำชุมชนทั้งหมดระบุว่าประชาชนในชุมชนได้ประกอบอาชีพเสริม โดยส่วนใหญ่ประกอบอาชีพค้าขาย ร้อยละ 44.1 รองลงมาประกอบอาชีพรับจ้างทั่วไป ร้อยละ 38.2 โดยผู้นำชุมชนทั้งหมดเห็นว่า คนในชุมชนมีฐานะทางเศรษฐกิจปานกลาง

จากการสัมภาษณ์ผู้นำชุมชนเกี่ยวกับการจ้างแรงงานในพื้นที่ พบว่า แรงงานภาคเกษตรกรรมส่วนใหญ่ไม่มีการจ้างงานในพื้นที่ ร้อยละ 64.7 รองลงมาไม่มีการจ้างงานในพื้นที่ ร้อยละ 35.3 โดยแรงงานทั้งหมดเป็นคนในพื้นที่ สำหรับแรงงานภาคอุตสาหกรรม พบว่า ผู้นำชุมชนทั้งหมดเห็นว่าการจ้างแรงงานในพื้นที่ โดยแรงงานส่วนใหญ่เป็นคนในพื้นที่ ร้อยละ 76.5

สำหรับสถานศึกษาในชุมชน พบว่า ผู้นำชุมชนส่วนใหญ่เห็นว่าไม่มีสถานศึกษาในชุมชน ร้อยละ 52.9 รองลงมาสถานศึกษาในชุมชน ร้อยละ 47.1 ในส่วนที่มีสถานศึกษาในชุมชนส่วนใหญ่เห็นว่า มีจำนวนสถานศึกษาในชุมชน 1 แห่ง ร้อยละ 87.5 รองลงมาจำนวนสถานศึกษาในชุมชน 2 แห่ง ร้อยละ 12.5

ผู้นำชุมชนส่วนใหญ่ระบุว่าไม่มีวัดในชุมชน ร้อยละ 88.2 รองลงมาระบุว่า ไม่มีวัดในชุมชน ร้อยละ 11.8 ในส่วนที่มีวัดในชุมชนส่วนใหญ่เห็นว่าจำนวนวัดในชุมชน 1 แห่ง ร้อยละ 93.3 รองลงมาเห็นว่าจำนวนวัดในชุมชน 2 แห่ง ร้อยละ 6.7

จากการสัมภาษณ์ผู้นำชุมชนเกี่ยวกับสถานที่ประกอบกิจกรรมทางศาสนา พบว่า ผู้นำชุมชนส่วนใหญ่เห็นว่าไม่มีสถานที่ประกอบกิจกรรม ร้อยละ 82.4 รองลงมาสถานที่ประกอบกิจกรรม ร้อยละ 17.6 ในส่วนที่มีสถานที่ประกอบกิจกรรมทางศาสนามีจำนวนมากที่สุด 2 แห่ง ร้อยละ 66.7 รองลงมาสถานที่ประกอบกิจกรรมทางศาสนา 1 แห่ง ร้อยละ 33.3

### 3) ข้อมูลด้านสาธารณสุขและสาธารณูปโภคในชุมชน

**ข้อมูลด้านสุขภาพ และสาธารณสุข** พบว่า ผู้นำชุมชนทั้งหมดระบุว่าไม่มีโรคที่เคยมะบาดในชุมชน เมื่อสอบถามถึงโรงพยาบาลส่งเสริมสุขภาพ/ศูนย์บริการสาธารณสุขในชุมชน พบว่า ผู้นำชุมชนส่วนใหญ่ ระบุว่าไม่มีโรงพยาบาลส่งเสริมสุขภาพ/ศูนย์บริการสาธารณสุขในชุมชน ร้อยละ 82.4 รองลงมาไม่มีโรงพยาบาลส่งเสริมสุขภาพ/ศูนย์บริการสาธารณสุขในชุมชน ร้อยละ 17.6 โดยระบุว่าไม่มีโรงพยาบาลส่งเสริมสุขภาพตำบลบ้านธาตุ โรงพยาบาลส่งเสริมสุขภาพตำบลบ้านป่า และโรงพยาบาลส่งเสริมสุขภาพตำบลหนองผักนึ่ง ร้อยละ 33.3 สัดส่วนที่เท่ากัน โดยเมื่อเจ็บป่วยแล้วผู้นำชุมชนจะเข้ารับการรักษาที่โรงพยาบาลส่งเสริมสุขภาพตำบล ร้อยละ 64.7 รองลงมาโรงพยาบาลประจำอำเภอ ร้อยละ 35.3 โดยผู้ให้สัมภาษณ์ส่วนใหญ่ ระบุว่าการให้บริการสาธารณสุขในพื้นที่เพียงพอในการให้บริการ ร้อยละ 70.6 รองลงมาระบุว่าการให้บริการสาธารณสุขในพื้นที่ไม่เพียงพอต่อการให้บริการ ร้อยละ 29.4 เนื่องจากอุปกรณ์ทางการแพทย์ไม่เพียงพอ ร้อยละ 60.0 รองลงมาคือบุคลากรไม่เพียงพอ ร้อยละ 40.0

**แหล่งน้ำบริโภค (น้ำดื่ม) ในครัวเรือน** พบว่า ครัวเรือนทั้งหมด ชื่อน้ำดื่มบรรจุถัง/ขวด มาบริโภค

**แหล่งน้ำอุปโภค (น้ำสำหรับซัก ล้าง น้ำใช้) ในครัวเรือน** พบว่า ครัวเรือนทั้งหมดใช้น้ำประปา

**แหล่งน้ำเพื่อการเกษตร** พบว่า ครัวเรือนส่วนใหญ่ใช้น้ำฝน ร้อยละ 45.7 รองลงมาได้ทำการเกษตร ร้อยละ 37.1

**การจัดหาน้ำเสีย/น้ำทิ้งของชุมชน** พบว่า ผู้นำชุมชนทั้งหมดระบุว่า ครัวเรือนในชุมชนจะระบายลงท่อระบายน้ำเทศบาล/อบต.

**การจัดขยะมูลฝอยในครัวเรือน** พบว่า ผู้นำชุมชนทั้งหมดระบุว่า มีการกำจัดโดยรวบรวมแล้วนำไปทิ้งถังขยะของเทศบาล/อบต.

### 4) สภาพแวดล้อมในปัจจุบัน

ผลจากการสัมภาษณ์ถึงสภาพสิ่งแวดล้อมในปัจจุบัน พบว่า ผู้นำชุมชนทั้งหมดระบุว่าในระยะ 1 ปีที่ผ่านมาสภาพสิ่งแวดล้อมในชุมชนที่อาศัยไม่มีการเปลี่ยนแปลงไปจากเดิม

#### ผลกระทบด้านสิ่งแวดล้อม

สำหรับปัญหาความเดือดร้อน/ความรำคาญด้านสิ่งแวดล้อมในชุมชนที่ได้รับในปัจจุบัน **ดังแสดงในตารางที่ 3** โดยสามารถสรุปปัญหาได้ 3 อันดับแรก ดังนี้

- **อันดับ 1 ฝุ่นละออง** พบว่า เป็นปัญหาที่ได้รับมากที่สุด ร้อยละ 100.0 ซึ่งมีระดับของผลกระทบที่ได้รับทั้งหมดอยู่ในระดับปานกลาง โดยสาเหตุของผลกระทบส่วนใหญ่ระบุว่าเกิดจากการจราจร ร้อยละ 73.5 รองลงมาโรงงานข้างเคียง ร้อยละ 26.4

- **อันดับ 2 เสียงดัง** พบว่า เป็นปัญหาที่ได้รับรองลงมา ร้อยละ 94.1 ซึ่งมีระดับของผลกระทบที่ได้รับทั้งหมดอยู่ในระดับปานกลาง ร้อย โดยสาเหตุของผลกระทบทั้งหมดระบุว่า เกิดจากการจราจร

- **อันดับ 3 การจราจร/อุบัติเหตุ** พบว่า เป็นปัญหาที่ได้รับ ร้อยละ 41.2 ซึ่งมีระดับของผลกระทบที่ได้รับทั้งหมดอยู่ในระดับปานกลาง โดยสาเหตุของผลกระทบทั้งหมดระบุว่า เกิดจากการจราจร

**ตารางที่ 3** ความคิดเห็นของผู้ให้สัมภาษณ์ต่อปัญหาความเดือดร้อน/ความรำคาญด้านสิ่งแวดล้อมที่ได้รับในปัจจุบัน

ผลกระทบ	ไม่มี (ร้อยละ)	มี (ร้อยละ)	ระดับผลกระทบ (ร้อยละ)			สาเหตุของผลกระทบ
			น้อย	ปานกลาง	มาก	
1. ฝุ่นละออง*	0.0	100.0	0.0	100.0	0.0	- การจราจร (73.5%) - โรงงานข้างเคียง (26.5%)
2. ควั่น/เขม่า	52.9	47.1	0.0	100.0	0.0	- การจราจร (87.5%) - โรงงานข้างเคียง (12.5%)
3. กลิ่นเหม็น	82.4	17.6	0.0	100.0	0.0	- ชุมชน (50.0%) - โรงงานข้างเคียง (50.0%)
4. เสียงดัง**	5.9	94.1	0.0	100.0	0.0	- การจราจร (100.0%)
5. ความอับชื้น/เหม็น	88.2	11.8	0.0	100.0	0.0	- การจราจร (100.0%)
6. ขยะมูลฝอยตกค้าง	64.7	35.3	0.0	83.3	16.7	- ชุมชน (58.3%) - รอบการจัดเก็บขยะ (25.0%) - ขยะล้น (16.7%)
7. น้ำเสีย	100.0	0.0	0.0	0.0	0.0	
8. น้ำทิ้ง	100.0	0.0	0.0	0.0	0.0	
9. น้ำท่วมขัง	82.4	17.6	0.0	100.0	0.0	- การระบายน้ำ (66.7%) - ปริมาณน้ำฝน (33.3%)



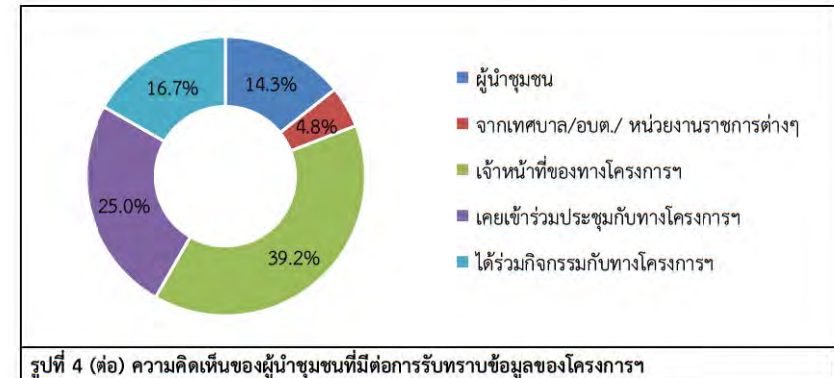
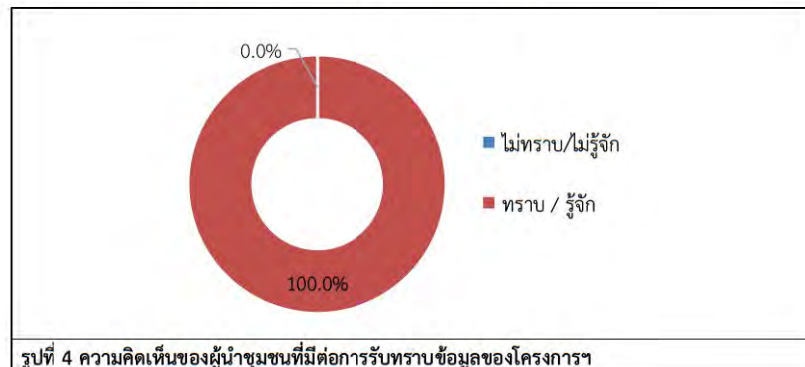
**ตารางที่ 3 (ต่อ) ความคิดเห็นของผู้ให้สัมภาษณ์ต่อปัญหาความเดือดร้อน/ความรำคาญด้านสิ่งแวดล้อมที่ได้รับในปัจจุบัน**

ผลกระทบ	ไม่มี (ร้อยละ)	มี (ร้อยละ)	ระดับผลกระทบ (ร้อยละ)			สาเหตุของผลกระทบ
			น้อย	ปานกลาง	มาก	
10. ดินเสื่อมคุณภาพ	100.0	0.0	0.0	0.0	0.0	
11. ถนนชำรุด/การคมนาคมไม่สะดวก	82.4	17.6	0.0	100.0	0.0	- การจราจร (50.0%) - การทำถนน (50.0%)
12. การจราจร/อุบัติเหตุ**	58.8	41.2	0.0	100.0	0.0	- การจราจร (100.0%)
13. การขาดแคลนน้ำใช้	88.2	11.8	0.0	100.0	0.0	- ฤดูแล้ง (100.0%)
14. การรั่วไหลของสารเคมี/ก๊าซธรรมชาติ	100.0	0.0	0.0	0.0	0.0	
15. การเกิดเพลิงไหม้/การระเบิด	100.0	0.0	0.0	0.0	0.0	

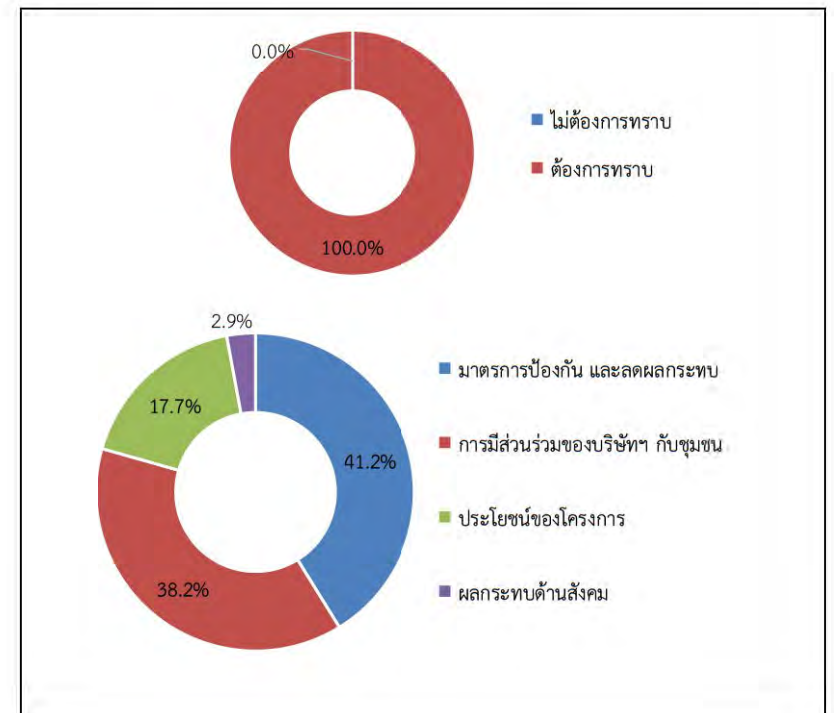
หมายเหตุ : \*, \*\*, \*\*\* หมายถึง ลำดับความคิดเห็นของผู้ให้สัมภาษณ์  
ที่มา : รวบรวมโดยบริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด, 2567

**5) การรับทราบข้อมูล/ข่าวสาร และการมีส่วนร่วมกิจกรรมของโรงไฟฟ้า**

ความคิดเห็นเกี่ยวกับโครงการโรงไฟฟ้าแก่งคอย 2 ของบริษัท แก่งคอย เพาเวอร์ เจเนอเรชั่น จำกัด พบว่า ผู้นำชุมชนทั้งหมด ทราบ/รู้จักโรงไฟฟ้า ส่วนผู้นำชุมชนที่ระบุว่า ทราบนั้นโดย 3 อันดับแรก ทราบจากเจ้าหน้าที่ของทางโครงการฯ ร้อยละ 39.2 รองลงมาเคยเข้าร่วมประชุมกับทางโครงการฯ ร้อยละ 25.0 และได้ร่วมกิจกรรมกับทางโครงการฯ ร้อยละ 16.7 ตามลำดับ โดยมีรายละเอียดดังรูปที่ 4

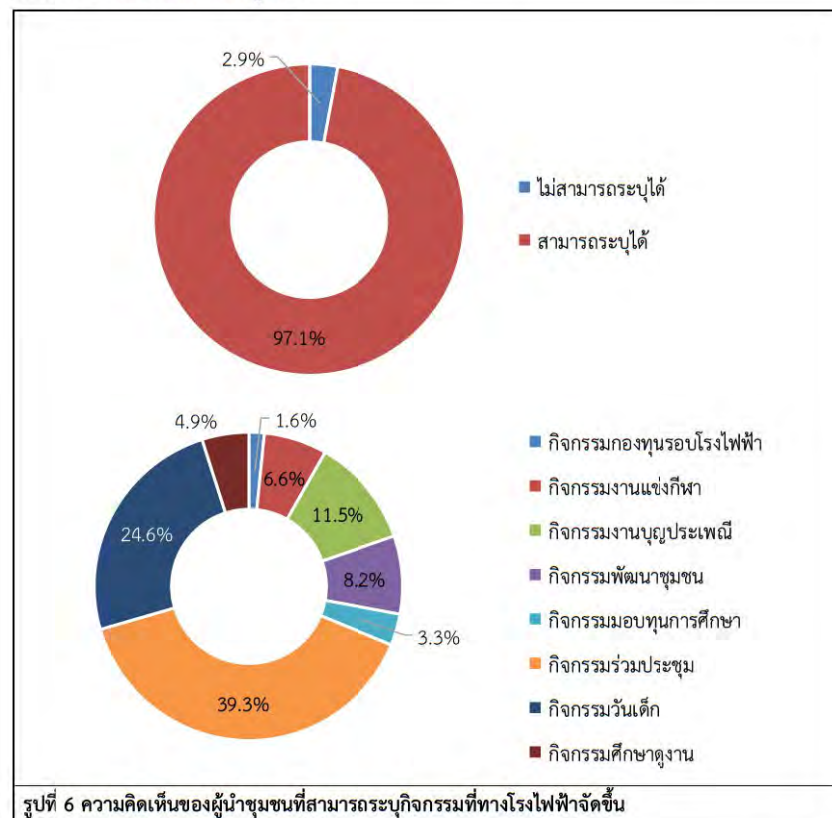


สำหรับข้อมูลการประชาสัมพันธ์ข่าวสารของโรงไฟฟ้า พบว่า ผู้นำชุมชนทั้งหมดต้องการรับทราบข้อมูล/ข่าวสารเกี่ยวกับโรงไฟฟ้า ทั้งนี้ข้อมูลที่ผู้นำชุมชนต้องการให้มีการประชาสัมพันธ์เพิ่มเติมโดย 3 อันดับแรก ต้องการทราบข้อมูลเกี่ยวกับมาตรการป้องกัน และลดผลกระทบ ร้อยละ 41.2 รองลงมาต้องการทราบการมีส่วนร่วมของบริษัทฯ กับชุมชน ร้อยละ 38.2 และประโยชน์ของโครงการ ร้อยละ 17.7 ตามลำดับ โดยมีรายละเอียดดังรูปที่ 5



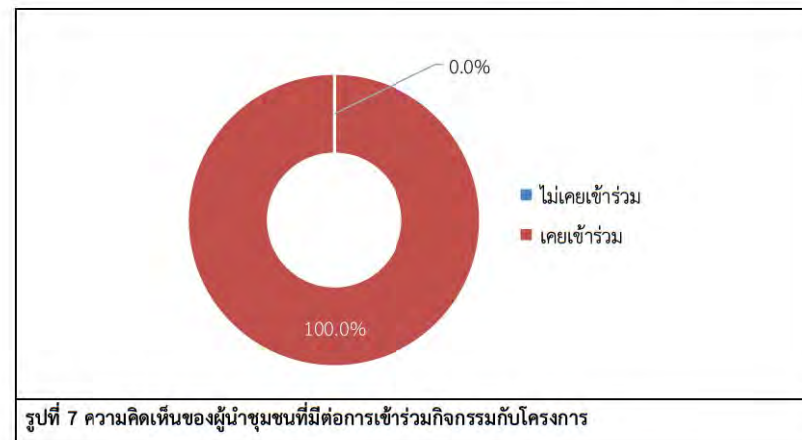
#### รูปที่ 5 ความคิดเห็นของผู้นำชุมชนที่มีต่อการประชาสัมพันธ์ข่าวสารของโครงการฯ

สำหรับกิจกรรมที่โรงไฟฟ้าจัดขึ้น พบว่า ผู้นำชุมชนส่วนใหญ่ระบุว่าสามารถระบุกิจกรรมได้ ร้อยละ 97.1 โดยกิจกรรมที่โรงไฟฟ้าจัดขึ้น 3 อันดับแรก กิจกรรมร่วมประชุม ร้อยละ 39.3 รองลงมากิจกรรมวันเด็ก ร้อยละ 24.6 และกิจกรรมงานบุญประเพณี ร้อยละ 11.5 ตามลำดับ รองลงมาไม่สามารถระบุได้ ร้อยละ 2.9 เมื่อสอบถามถึงการเข้าร่วมกิจกรรมกับทางโรงไฟฟ้า ผู้นำชุมชนทั้งหมดระบุว่า เคยเข้าร่วมกิจกรรมกับโรงไฟฟ้า โดยผู้นำชุมชนที่ระบุว่า เคยเข้าร่วมกิจกรรม เนื่องจาก ส่งเสริมชุมชน ร้อยละ 38.2 รองลงมากิจกรรมมีประโยชน์ ร้อยละ 35.3 โดยมีรายละเอียดดังรูปที่ 6



รูปที่ 6 ความคิดเห็นของผู้นำชุมชนที่สามารถระบุกิจกรรมที่ทางโรงไฟฟ้าจัดขึ้น

สำหรับช่วงที่ผ่านมามีการเข้าร่วมกิจกรรมกับทางโรงไฟฟ้า ๆ พบว่าผู้นำชุมชนทั้งหมดระบุว่า เคยเข้าร่วมกิจกรรมกับทางโรงไฟฟ้า ๆ โดยมีรายละเอียดดังรูปที่ 7



รูปที่ 7 ความคิดเห็นของผู้นำชุมชนที่มีต่อการเข้าร่วมกิจกรรมกับโครงการ

เมื่อสอบถามถึงการรู้จักกิจกรรมที่โรงไฟฟ้า จัดขึ้น ซึ่งมีรายละเอียดดังตารางที่ 4 โดยสามารถสรุปได้ดังนี้

- กิจกรรมร่วมประชุม พบว่า ผู้นำชุมชนทั้งหมด รู้จักกิจกรรม ซึ่งผู้นำชุมชนทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- กิจกรรมศึกษาดูงาน พบว่า ผู้นำชุมชนทั้งหมด รู้จักกิจกรรม ซึ่งผู้นำชุมชนทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- กิจกรรมอบรมให้ความรู้ พบว่า ผู้นำชุมชนทั้งหมด รู้จักกิจกรรม ซึ่งผู้นำชุมชนทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- กิจกรรมให้ทุนการศึกษานักเรียน พบว่า ผู้นำชุมชนทั้งหมด รู้จักกิจกรรม ซึ่งผู้นำชุมชนทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- กิจกรรมวันเด็ก พบว่า ผู้นำชุมชนทั้งหมด รู้จักกิจกรรม ซึ่งผู้นำชุมชนทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- สนับสนุนกิจกรรมในชุมชน พบว่า ผู้นำชุมชนทั้งหมด รู้จักกิจกรรม ซึ่งผู้นำชุมชนทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- กิจกรรมด้านสิ่งแวดล้อม พบว่า ผู้นำชุมชนทั้งหมด รู้จักกิจกรรม ซึ่งผู้นำชุมชนทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- กิจกรรมชุมชนสัมพันธ์ พบว่า ผู้นำชุมชนทั้งหมด รู้จักกิจกรรม ซึ่งผู้นำชุมชนทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- กิจกรรมตรวจสุขภาพ พบว่า ผู้นำชุมชนทั้งหมด รู้จักกิจกรรม ซึ่งผู้นำชุมชนทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง

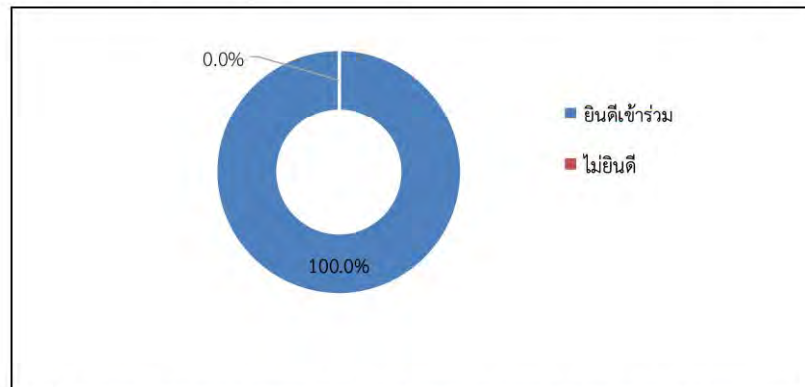


ตารางที่ 4 ความเห็นของผู้นำชุมชนต่อการรู้จักกิจกรรมที่โรงไฟฟ้า จัดขึ้น

กิจกรรมที่โรงไฟฟ้า จัดขึ้น	การรู้จัก		ความต้องการให้ดำเนินการต่อเนื่อง	
	ไม่รู้จัก	รู้จัก	ไม่ต้องการ	ต้องการ
1. กิจกรรมร่วมประชุม	0.0	100.0	0.0	100.0
2. กิจกรรมศึกษาดูงาน	0.0	100.0	0.0	100.0
3. กิจกรรมอบรมให้ความรู้	0.0	100.0	0.0	100.0
4. กิจกรรมให้ทุนการศึกษานักเรียน	0.0	100.0	0.0	100.0
5. กิจกรรมวันเด็ก	0.0	100.0	0.0	100.0
6. สนับสนุนกิจกรรมในชุมชน	0.0	100.0	0.0	100.0
7. กิจกรรมด้านสิ่งแวดล้อม	0.0	100.0	0.0	100.0
8. กิจกรรมชุมชนสัมพันธ์	0.0	100.0	0.0	100.0
9. กิจกรรมตรวจสอบสภาพ	0.0	100.0	0.0	100.0

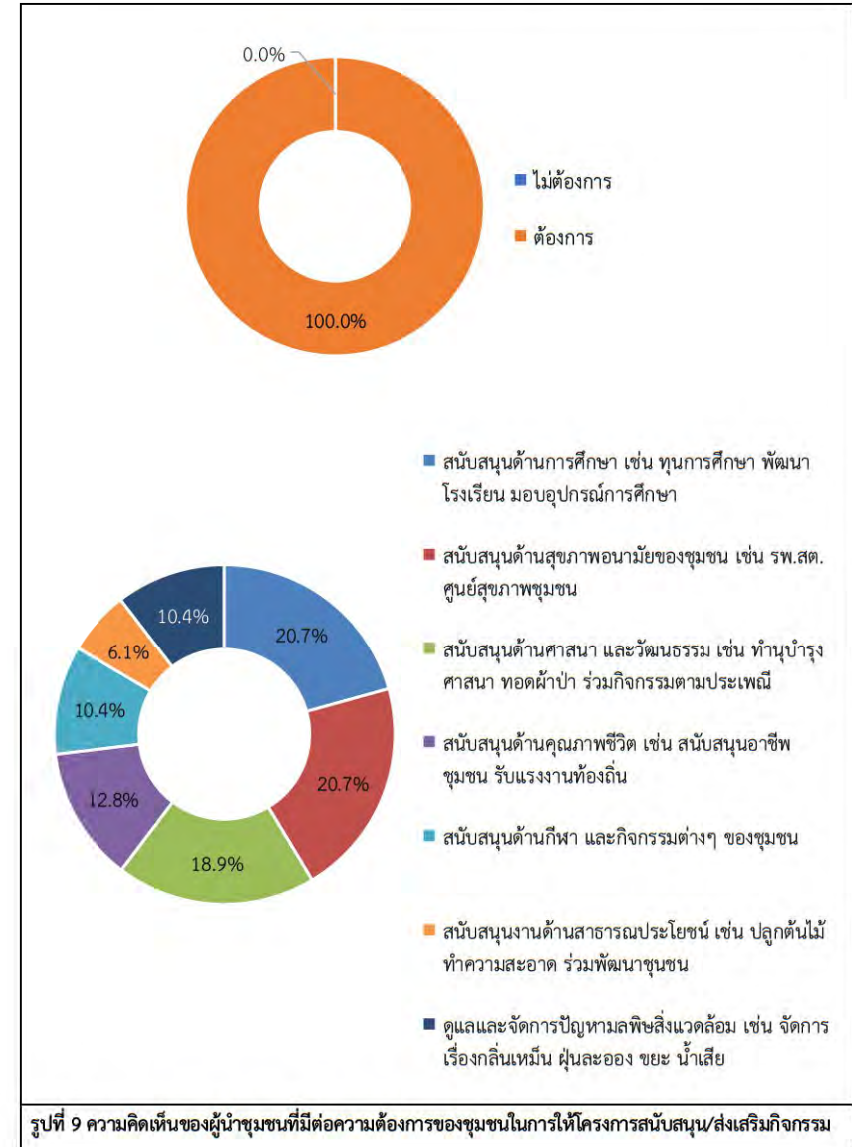
ที่มา : รวบรวมโดยบริษัท เอแอลเอส แลบริจอรี่ กรุ๊ป (ประเทศไทย) จำกัด, 2567

เมื่อสอบถามผู้นำชุมชนว่าหากโครงการโรงไฟฟ้า จัดกิจกรรมที่เป็นประโยชน์ต่อชุมชนและสิ่งแวดล้อมร่วมกับชุมชน พบว่าผู้นำชุมชนทั้งหมดระบุว่า ยินดีเข้าร่วมเข้าร่วม โดยมีรายละเอียดดังรูปที่ 8



รูปที่ 8 ความคิดเห็นของผู้นำชุมชนที่มีต่อการจัดกิจกรรมที่เป็นประโยชน์ต่อชุมชนและสิ่งแวดล้อมร่วมกับชุมชน

ผู้นำชุมชนทั้งหมดระบุว่า หากทางโรงไฟฟ้า จัดกิจกรรมร่วมกับชุมชนยินดีเข้าร่วมกิจกรรม สำหรับความต้องการของชุมชนในการให้โรงไฟฟ้าสนับสนุน/ส่งเสริมกิจกรรม พบว่า ผู้นำชุมชนทั้งหมดต้องการให้ทางโรงไฟฟ้า ส่งเสริมกิจกรรม ซึ่งผู้นำชุมชนส่วนใหญ่โดย 3 อันดับแรก ต้องการให้สนับสนุนด้านการศึกษา เช่น ทุนการศึกษา พัฒนาโรงเรียน มอบอุปกรณ์การศึกษา และสนับสนุนด้านสุขภาพอนามัยของชุมชน เช่น รพ.สต. ศูนย์สุขภาพชุมชน ร้อยละ 20.7 สัดส่วนที่เท่ากัน รองลงมาสนับสนุนด้านศาสนา และวัฒนธรรม เช่น ทำนุบำรุงศาสนา ทอดผ้าป่า ร่วมกิจกรรมตามประเพณี ร้อยละ 18.9 และสนับสนุนด้านคุณภาพชีวิต เช่น สนับสนุนอาชีพชุมชน รับแรงงานท้องถิ่น 12.8 ตามลำดับ โดยมีรายละเอียดดังรูปที่ 9



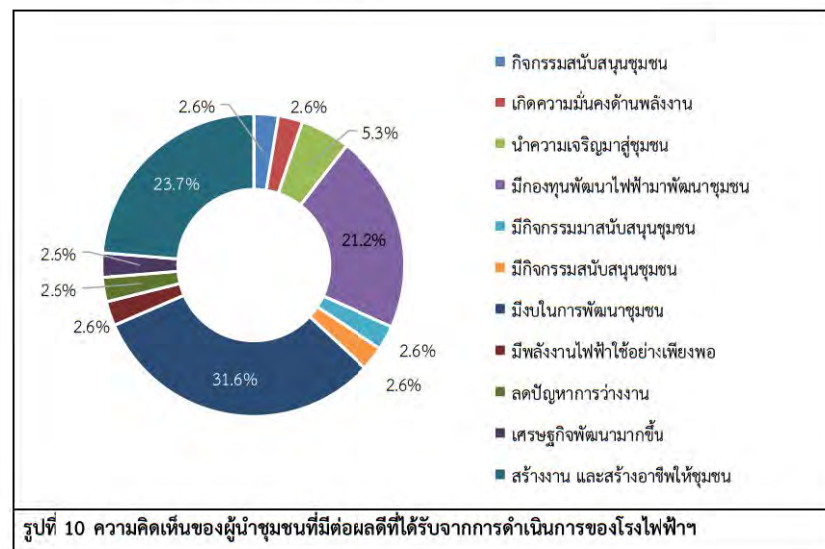
รูปที่ 9 ความคิดเห็นของผู้นำชุมชนที่มีต่อความต้องการของชุมชนในการให้โครงการสนับสนุน/ส่งเสริมกิจกรรม

## 6) ผลกระทบและทัศนคติต่อการดำเนินงานของโครงการโรงไฟฟ้าแก่งคอย

### 6.1) ผลดีและผลเสียที่ได้รับการดำเนินการของโรงไฟฟ้า สามารถสรุปได้ดังนี้

**ผลดีที่ได้รับการดำเนินการของโรงไฟฟ้า** ผู้นำชุมชนได้รับผลดี จำนวน 34 ราย ซึ่งมีรายละเอียดดังรูปที่ 10 โดยสามารถสรุปผลดีได้ดังนี้

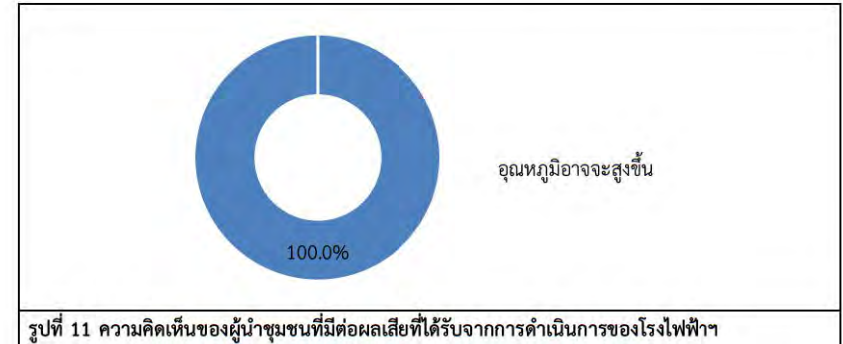
- มีงบในการพัฒนาชุมชน	ร้อยละ 31.6
- สร้างงาน และสร้างอาชีพให้ชุมชน	ร้อยละ 23.7
- มีกองทุนพัฒนาไฟฟ้ามาพัฒนาชุมชน	ร้อยละ 21.2
- นำความเจริญมาสู่ชุมชน	ร้อยละ 5.3
- กิจกรรมสนับสนุนชุมชน	ร้อยละ 2.6
- เกิดความมั่นคงด้านพลังงาน	ร้อยละ 2.6
- มีกิจกรรมมาสนับสนุนชุมชน	ร้อยละ 2.6
- มีกิจกรรมสนับสนุนชุมชน	ร้อยละ 2.6
- มีพลังงานไฟฟ้าใช้อย่างเพียงพอ	ร้อยละ 2.6
- ลดปัญหาการว่างงาน	ร้อยละ 2.6
- เศรษฐกิจพัฒนามากขึ้น	ร้อยละ 2.6



รูปที่ 10 ความคิดเห็นของผู้นำชุมชนที่มีต่อผลดีที่ได้รับการดำเนินการของโรงไฟฟ้า

**ผลเสียที่ได้รับการดำเนินการของโรงไฟฟ้า** ผู้นำชุมชนได้รับผลเสีย จำนวน 2 ราย ซึ่งมีรายละเอียดดังรูปที่ 11 โดยสามารถสรุปผลเสียได้ดังนี้

- อุณหภูมิอาจจะสูงขึ้น	ร้อยละ 100.0
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### 6.2) ความพึงพอใจต่อการดูแลสังคมที่ผ่านมา ซึ่งมีรายละเอียดดังตารางที่ 5 โดยสามารถสรุปได้ดังนี้

- ด้านความปลอดภัยจากการดำเนินงาน พบว่า ผู้นำชุมชนส่วนใหญ่มีความพึงพอใจในระดับปานกลาง ร้อยละ 58.8 รองลงมามีความพึงพอใจในระดับมาก ร้อยละ 38.3 มีค่าเฉลี่ยความพึงพอใจอยู่ในระดับปานกลาง ( $\bar{x} = 3.44$ )
- ด้านสังคม พบว่า ผู้นำชุมชนส่วนใหญ่มีความพึงพอใจในระดับปานกลาง ร้อยละ 58.8 รองลงมามีความพึงพอใจในระดับมาก ร้อยละ 38.3 มีค่าเฉลี่ยความพึงพอใจอยู่ในระดับปานกลาง ( $\bar{x} = 3.44$ )
- ด้านสิ่งแวดล้อม พบว่า ผู้นำชุมชนส่วนใหญ่มีความพึงพอใจในระดับปานกลาง ร้อยละ 58.8 รองลงมามีความพึงพอใจในระดับมาก ร้อยละ 38.3 มีค่าเฉลี่ยความพึงพอใจอยู่ในระดับปานกลาง ( $\bar{x} = 3.44$ )
- ด้านกิจกรรมชุมชนสัมพันธ์/การมีส่วนร่วม พบว่า ผู้นำชุมชนส่วนใหญ่มีความพึงพอใจในระดับปานกลาง ร้อยละ 58.8 รองลงมามีความพึงพอใจในระดับมาก ร้อยละ 38.3 มีค่าเฉลี่ยความพึงพอใจอยู่ในระดับปานกลาง ( $\bar{x} = 3.44$ )
- ด้านการดูแลสุขภาพของประชาชน พบว่า ผู้นำชุมชนส่วนใหญ่มีความพึงพอใจในระดับปานกลาง ร้อยละ 58.8 รองลงมามีความพึงพอใจในระดับมาก ร้อยละ 38.3 มีค่าเฉลี่ยความพึงพอใจอยู่ในระดับปานกลาง ( $\bar{x} = 3.44$ )
- การเปิดเผยข้อมูล พบว่า ผู้นำชุมชนส่วนใหญ่มีความพึงพอใจในระดับปานกลาง ร้อยละ 58.8 รองลงมามีความพึงพอใจในระดับมาก ร้อยละ 38.3 มีค่าเฉลี่ยความพึงพอใจอยู่ในระดับปานกลาง ( $\bar{x} = 3.44$ )

ตารางที่ 5 ความเห็นของผู้นำชุมชนต่อความพึงพอใจต่อการดูแลสังคมของโรงไฟฟ้า

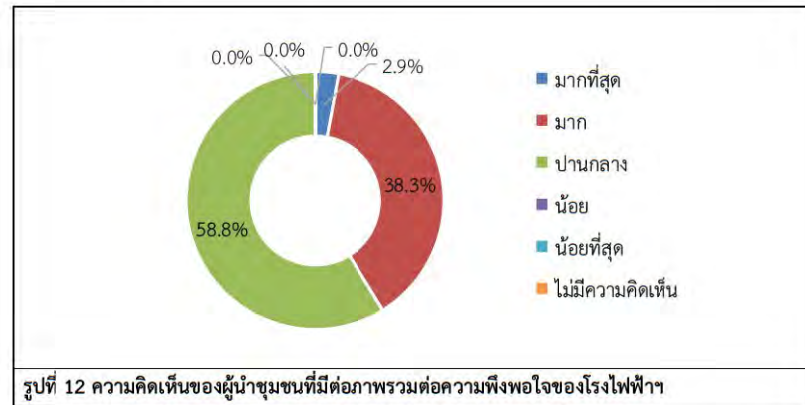
การดูแลสังคม	ระดับความพึงพอใจ					ค่าเฉลี่ย $\bar{x}$	แปลผล <sup>1)</sup>
	น้อยที่สุด	น้อย	ปานกลาง	มาก	มากที่สุด		
1. ด้านความปลอดภัยในกระบวนการผลิต	0.0	0.0	58.8	38.3	2.9	3.44	ปานกลาง
2. ด้านสังคม	0.0	0.0	58.8	38.3	2.9	3.44	ปานกลาง
3. ด้านสิ่งแวดล้อม	0.0	0.0	58.8	38.3	2.9	3.44	ปานกลาง
4. ด้านกิจกรรมชุมชนสัมพันธ์/การมีส่วนร่วม	0.0	0.0	58.8	38.3	2.9	3.44	ปานกลาง
5. ด้านการดูแลสุขภาพของประชาชน	0.0	0.0	58.8	38.3	2.9	3.44	ปานกลาง
6. การเปิดเผยข้อมูล	0.0	0.0	58.8	38.3	2.9	3.44	ปานกลาง



**หมายเหตุ:** การแปลผลค่าเฉลี่ย 1.00 - 1.50 = น้อยที่สุด  
1.51 - 2.50 = น้อย  
2.51 - 3.50 = ปานกลาง  
3.51 - 4.50 = มาก  
4.51 - 5.00 = มากที่สุด

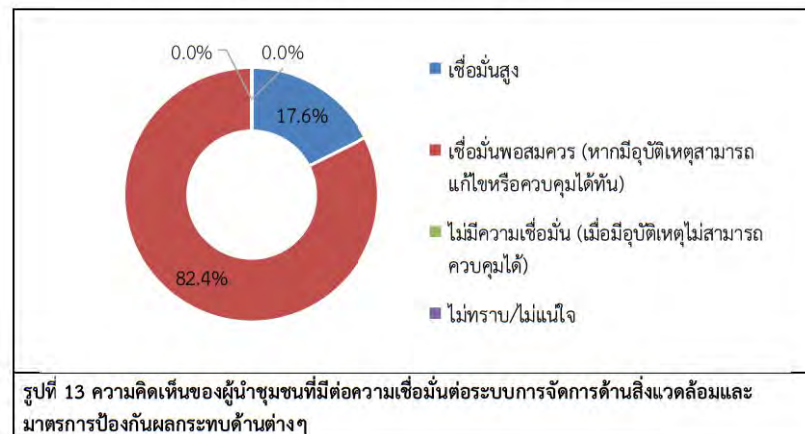
ที่มา : รวบรวมโดยบริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด, 2567

สำหรับความคิดเห็นในภาพรวมต่อความพึงพอใจของโรงไฟฟ้า พบว่า ผู้นำชุมชนส่วนใหญ่มีความพึงพอใจในระดับปานกลาง ร้อยละ 58.8 รองลงมามีความพึงพอใจในระดับปานมาก ร้อยละ 38.3 โดยมีรายละเอียดดังรูปที่ 12

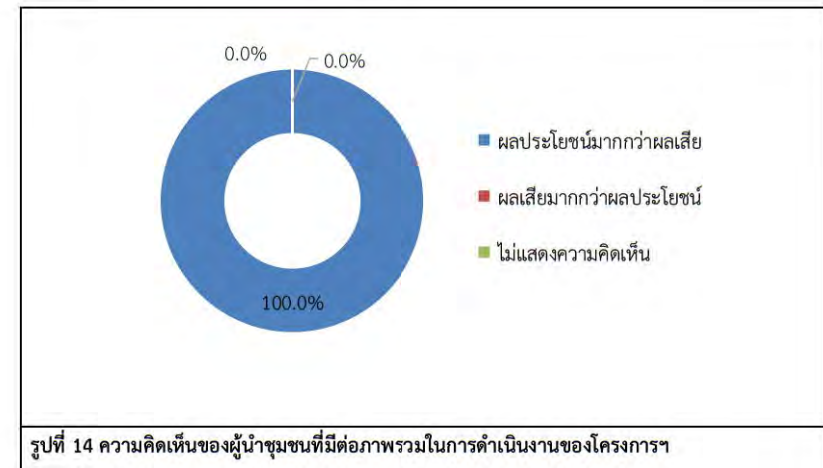


#### 7) ความเชื่อมั่น และความคิดเห็นต่อโรงไฟฟ้า

ในด้านความเชื่อมั่นต่อระบบการจัดการด้านสิ่งแวดล้อมและมาตรการป้องกันผลกระทบด้านต่างๆของโรงไฟฟ้า พบว่า ผู้นำชุมชนส่วนใหญ่ เชื่อว่า เชื่อมั่นพอสมควร (หากมีอุบัติเหตุสามารถแก้ไขหรือควบคุมได้ทัน) ร้อยละ 82.4 รองลงมาเชื่อมั่นสูง ร้อยละ 17.6 โดยมีรายละเอียดดังรูปที่ 13



ความคิดเห็นในภาพรวมต่อการดำเนินงานของโรงไฟฟ้า ในปี พ.ศ. 2567 พบว่าผู้นำชุมชนทั้งหมดระบุว่า ผลประโยชน์มากกว่าผลเสีย โดยเหตุผล 3 อันดับแรก ให้เหตุผลว่าเศรษฐกิจในชุมชนดีขึ้น ร้อยละ 32.4 รองลงมาเศรษฐกิจและการค้าขายต่างๆ ดีขึ้น ร้อยละ 23.5 และเกิดความมั่นคงด้านไฟฟ้าและพลังงาน ร้อยละ 14.7 ตามลำดับ โดยมีรายละเอียดดังรูปที่ 14



สำหรับข้อเสนอแนะอื่นๆ ที่เกี่ยวกับโครงการฯ สามารถสรุปเป็นประเด็นสำคัญได้ดังนี้

- มาทำกิจกรรมร่วมกับชุมชนอย่างต่อเนื่อง ร้อยละ 20.5
- ส่งเสริมกิจกรรมตามประเพณี ร้อยละ 12.7
- สนับสนุนด้านทุนการศึกษาและกิจกรรมทางศาสนา ร้อยละ 12.7
- ส่งเสริมอาชีพให้คนยากไร้ในชุมชน ร้อยละ 10.3
- สนับสนุนกิจกรรมที่ทางชุมชนจัดขึ้น ร้อยละ 10.3
- สนับสนุนงบประมาณในการพัฒนาชุมชนเพิ่มขึ้น ร้อยละ 7.7
- ส่งเสริมด้านสาธารณสุขในชุมชน ร้อยละ 5.1
- สนับสนุนด้านสาธารณูปโภคต่าง ๆ ในชุมชน ร้อยละ 5.1
- สนับสนุนกิจกรรมศึกษาดูงาน ร้อยละ 2.6
- มาพบปะผู้นำและชุมชนและประชาสัมพันธ์ข่าวสารใหม่ ๆ ของโครงการ ร้อยละ 2.6
- สนับสนุนกิจกรรมจิตอาสาพัฒนาชุมชน ร้อยละ 2.6
- สนับสนุนด้านถุงยังชีพให้กับคนพิการและผู้ป่วยติดเตียง ร้อยละ 2.6
- สนับสนุนถุงยังชีพให้แก่คนพิการและผู้สูงอายุ ร้อยละ 2.6
- สนับสนุนอุปกรณ์ช่วยผู้ป่วยติดเตียงหรือคนพิการ ร้อยละ 2.6



### (3) ผลการสำรวจความคิดเห็นของกลุ่มครัวเรือน

การสำรวจความคิดเห็นของกลุ่มครัวเรือนในพื้นที่ที่มี 5 กิโลเมตรรอบที่ตั้งโครงการ ครอบคลุมพื้นที่ศึกษา 17 ชุมชน โดยได้สำรวจความคิดเห็นครัวเรือนทั้งหมดจำนวน 392 ตัวอย่าง (แสดงรายละเอียดของกลุ่มตัวอย่างดังตารางที่ 1) ผลการสำรวจความคิดเห็น แสดงดังเอกสารแนบ 2 และสามารถสรุปรายละเอียดของผลการศึกษาได้ดังนี้

#### 1) ข้อมูลทั่วไป

ผู้ให้สัมภาษณ์ส่วนใหญ่เป็นเพศหญิง ร้อยละ 54.1 และเป็นเพศชาย ร้อยละ 45.9 ซึ่งผู้ให้สัมภาษณ์มีอายุอยู่ระหว่าง 41-50 ปี ร้อยละ 37.5 รองลงมามีอายุอยู่ระหว่าง 31-40 ปี ร้อยละ 22.2 การนับถือศาสนาพบว่า ผู้ให้สัมภาษณ์ทั้งหมด นับถือศาสนาพุทธ ผู้ให้สัมภาษณ์ส่วนใหญ่สถานภาพแต่งงาน/อยู่ด้วยกัน ร้อยละ 70.2 รองลงมาสถานภาพหย่า/แยกทางกัน ร้อยละ 14.3 สำหรับด้านการศึกษาพบว่าผู้ให้สัมภาษณ์มีการศึกษามัธยมศึกษาตอนต้น (ม.3) ร้อยละ 39.5 รองลงมามีการศึกษาระดับอนุปริญา/ปวส.หรือเทียบเท่า ร้อยละ 24.7 ซึ่งผู้ให้สัมภาษณ์ส่วนใหญ่มีสถานภาพเป็นหัวหน้าครัวเรือน/เจ้าบ้าน ร้อยละ 63.8 รองลงมาเป็นสมาชิกในครัวเรือน ร้อยละ 36.2 โดยสมาชิกในครัวเรือนส่วนใหญ่เป็นคู่สมรส ร้อยละ 59.2 รองลงมาเป็นบุตร ร้อยละ 30.3

เมื่อสัมภาษณ์ถึงภูมิลำเนาเดิม พบว่า ผู้ให้สัมภาษณ์อยู่ที่นี้ตั้งแต่เกิด ร้อยละ 80.6 รองลงมาย้ายมาจากที่อื่น ร้อยละ 19.4 ในส่วนที่ย้ายมาจากที่อื่นซึ่งส่วนใหญ่ย้ายมาจากภาคตะวันออกเฉียงเหนือ ร้อยละ 42.1 รองลงมาย้ายมาจากภาคกลาง ร้อยละ 30.3 ซึ่งระยะเวลาของผู้ที่ย้ายมาจากถิ่นอื่นส่วนใหญ่อยู่ระหว่าง 16 -20 ปี ร้อยละ 68.4 รองลงมาย้ายเข้ามาอยู่ในพื้นที่มากกว่า 20 ปีขึ้นไป ร้อยละ 18.4

เมื่อสัมภาษณ์ถึงการถือครองที่ดิน พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่มีที่ดินโดยเช่าผู้อื่น ร้อยละ 60.5 รองลงมาเป็นเจ้าของตัวเอง ร้อยละ 39.5 สำหรับผู้ถือครองที่ดินโดยการเช่าผู้อื่นทั้งหมดเช่าเพื่อเป็นที่อยู่อาศัย ซึ่งส่วนใหญ่มีพื้นที่ในการเช่า จำนวน 21-30 ไร่ ร้อยละ 53.3 สำหรับผู้มีที่ดินเป็นกรรมสิทธิ์ของตัวเองส่วนใหญ่มีพื้นที่เป็นของตนเองจำนวน 41-50 ไร่ ร้อยละ 36.7 รองลงมามีพื้นที่เป็นของตนเองจำนวน 31-40 ไร่ ร้อยละ 26.7 เป็นที่อยู่อาศัยส่วนใหญ่อยู่ระหว่าง 41-50 ไร่ ร้อยละ 43.3

#### 2) ข้อมูลด้านสภาพเศรษฐกิจของครัวเรือน

ผู้ให้สัมภาษณ์ส่วนใหญ่มีจำนวนสมาชิกในครัวเรือนระหว่าง 4-6 คน ร้อยละ 72.2 รองลงมาจำนวนสมาชิกในครัวเรือนระหว่าง 1-3 คน ร้อยละ 26.5 สำหรับการประกอบอาชีพหลัก พบว่า ผู้ให้สัมภาษณ์ประกอบอาชีพค้าขาย/ ธุรกิจส่วนตัว ร้อยละ 41.1 รองลงมาประกอบอาชีพพนักงานบริษัท/ พนักงานโรงงาน ร้อยละ 23.2 ทั้งนี้ผู้ให้สัมภาษณ์ส่วนใหญ่ระบุว่าไม่ได้ประกอบอาชีพเสริม ร้อยละ 99.0 และมีบางส่วน ร้อยละ 1.0 ระบุว่าได้ประกอบอาชีพเสริม โดยส่วนใหญ่ประกอบอาชีพรับจ้างทั่วไป ร้อยละ 75.0 และประกอบอาชีพค้าขาย ร้อยละ 25.0 ซึ่งผู้ให้สัมภาษณ์ทั้งหมดระบุว่าไม่ประสบปัญหาในการประกอบอาชีพ โดยมีรายได้รวมของครัวเรือนต่อเดือนผู้ให้สัมภาษณ์ส่วนใหญ่ระบุว่ามีรายได้อยู่ระหว่าง 30,001 – 35,000 บาท/เดือน ร้อยละ 55.9 รองลงมาไม่มีรายได้ อยู่ระหว่าง 25,001 – 30,000 บาท/เดือน ร้อยละ 27.0 และรายจ่ายต่อครัวเรือนรายเดือน ผู้ให้สัมภาษณ์ส่วนใหญ่ระบุว่า รายจ่ายส่วนใหญ่อยู่ระหว่าง 20,001 – 30,000 บาท/เดือน ร้อยละ 50.0 รองลงมารายจ่ายอยู่ระหว่าง 25,001 – 30,000 บาท/เดือน ร้อยละ 25.8 ส่วนเมื่อพิจารณาถึงความเพียงพอของรายได้เปรียบเทียบกับรายจ่าย

ของครัวเรือน ผู้ให้สัมภาษณ์ระบุว่า มีรายได้เพียงพอ มีเหลือเก็บออม ร้อยละ 76.0 รองลงมาไม่มีรายได้เพียงพอ แต่ไม่มีเก็บออม ร้อยละ 22.4

### 3) ข้อมูลด้านสาธารณสุขและสาธารณสุขในชุมชน

**ข้อมูลด้านสาธารณสุข/สุขภาพ** พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่ระบุว่า ในรอบปีที่ผ่านมาจนถึงปัจจุบันตนเองและบุคคลในครอบครัวไม่เคยเจ็บป่วย ร้อยละ 65.3 เคยเจ็บป่วย ร้อยละ 34.7 โดยเคยเจ็บป่วยส่วนใหญ่ 3 อันดับแรก ซึ่งเจ็บป่วยเป็นโรคหวัด/ ทางเดินหายใจ ร้อยละ 21.3 รองลงมาเป็นโรคเกี่ยวกับระบบทางเดินอาหาร ร้อยละ 18.4 และโรคเกี่ยวกับระบบกล้ามเนื้อและกระดูก ร้อยละ 17.6 ตามลำดับ โดยผู้ให้สัมภาษณ์ส่วนใหญ่ระบุว่า สาเหตุของโรคที่เจ็บป่วยมาจากโรคประจำตัว/ระบบร่างกายบกพร่อง ร้อยละ 52.9 รองลงมาสาเหตุมาจากอากาศเปลี่ยนแปลง ร้อยละ 27.9 โดยเมื่อเจ็บป่วยแล้วผู้ให้สัมภาษณ์จะเข้ารับการรักษาที่โรงพยาบาลของรัฐ ร้อยละ 51.5 รองลงมาโรงพยาบาลส่งเสริมสุขภาพของตำบล ร้อยละ 23.5 โดยผู้ให้สัมภาษณ์ส่วนใหญ่ ระบุว่า การให้บริการสาธารณสุขในพื้นที่ไม่มีปัญหาในการให้บริการ ร้อยละ 97.0 มีเพียง ร้อยละ 3.0 ที่ระบุว่า มีปัญหาการให้บริการ โดยมีปัญหาส่วนใหญ่จาก การบริการช้า ร้อยละ 80.0

**แหล่งน้ำบริโภค (น้ำดื่ม) ในครัวเรือน** พบว่า ผู้ให้สัมภาษณ์ทั้งหมดใหญ่ระบุว่า ชื่อน้ำบรรจุถัง/ขวด ทั้งนี้ผู้ให้สัมภาษณ์ทั้งหมดระบุว่าไม่มีปัญหาคุณภาพน้ำบริโภค (น้ำดื่ม) ซึ่งผู้ให้สัมภาษณ์ทั้งหมดระบุว่า มีปริมาณน้ำบริโภค (น้ำดื่ม) อย่างเพียงพอ

**แหล่งน้ำอุปโภค (น้ำสำหรับซัก ล้าง น้ำใช้) ในครัวเรือน** พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่ระบุว่าใช้น้ำประปา ร้อยละ 99.5 รองลงมาน้ำบาดาล และชื่อน้ำใช้ ร้อยละ 0.3 สัดส่วนที่เท่ากัน ทั้งนี้ผู้ให้สัมภาษณ์ส่วนใหญ่ระบุว่า ไม่มีปัญหาคุณภาพน้ำอุปโภค (น้ำใช้) ร้อยละ 96.2 รองลงมามีปัญหา ร้อยละ 3.8 โดยระบุว่าน้ำขุ่น ร้อยละ 93.3 รองลงมากลิ่น ร้อยละ 6.7 ซึ่งผู้ให้สัมภาษณ์ทั้งหมดระบุว่า มีปริมาณน้ำอุปโภค (น้ำใช้) อย่างเพียงพอ

**แหล่งน้ำเพื่อการเกษตร** พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่ระบุว่า ไม่ได้ทำการเกษตร ร้อยละ 97.2 รองลงมาทำไร่ ทำนาในแม่น้ำ/ลำคลอง ร้อยละ 2.6 ทั้งนี้ผู้ให้สัมภาษณ์ทั้งหมดระบุว่า ไม่มีปัญหาคุณภาพน้ำเพื่อการเกษตร ซึ่งผู้ให้สัมภาษณ์ทั้งหมดระบุว่า มีปริมาณน้ำเพื่อการเกษตร อย่างเพียงพอ

**การจัดน้ำเสีย/น้ำทิ้งของชุมชน** พบว่า ครัวเรือนทั้งหมดในชุมชนระบายลงท่อระบายน้ำเทศบาล

**การจัดขยะ/มูลฝอยในครัวเรือน** พบว่า ผู้ให้สัมภาษณ์ทั้งหมดจะรวบรวมแล้วนำไปทิ้งถึงขยะของเทศบาล/อบต.

### 4) สภาพแวดล้อมในปัจจุบัน

ผลจากการสัมภาษณ์ถึงสภาพสิ่งแวดล้อมในปัจจุบัน พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่ระบุว่าในระยะ 1 ปีที่ผ่านมาสภาพสิ่งแวดล้อมในชุมชนที่อาศัยไม่มีการเปลี่ยนแปลงไปจากเดิม ร้อยละ 99.2 รองลงมาสภาพสิ่งแวดล้อมมีการเปลี่ยนแปลงไปจากเดิมเล็กน้อย ร้อยละ 0.5 ผู้ให้สัมภาษณ์ส่วนใหญ่ระบุว่าชุมชนมีการเปลี่ยนแปลงประชากรแฝงเพิ่มขึ้น และมีการพัฒนาสาธารณูปโภคมากขึ้น ร้อยละ 50.0 สัดส่วนที่เท่ากัน



### ผลกระทบด้านสิ่งแวดล้อม

สำหรับปัญหาความเดือดร้อน/ความรำคาญด้านสิ่งแวดล้อมในชุมชนที่ได้รับในปัจจุบัน  
ดังแสดงในตารางที่ 6 โดยสามารถสรุปปัญหาได้ 3 อันดับแรก ดังนี้

- **อันดับ 1 ฝุ่นละออง** พบว่า เป็นปัญหาที่ได้รับมากที่สุด ร้อยละ 99.2 ซึ่งมีระดับของผลกระทบที่ได้รับส่วนใหญ่อยู่ในระดับปานกลาง ร้อยละ 71.5 โดยสาเหตุของผลกระทบส่วนใหญ่ระบุว่าเป็นจากการจราจร ร้อยละ 81.3
- **อันดับ 2 เสียงดัง** พบว่า เป็นปัญหาที่ได้รับรองลงมา ร้อยละ 38.0 ซึ่งมีระดับของผลกระทบที่ได้รับส่วนใหญ่อยู่ในระดับน้อย ร้อยละ 55.7 โดยสาเหตุของผลกระทบส่วนใหญ่ระบุว่าเป็นจากการจราจร ร้อยละ 68.5
- **อันดับ 3 ครว/เขม่า** พบว่า เป็นปัญหาที่ได้รับ ร้อยละ 27.3 ซึ่งมีระดับของผลกระทบที่ได้รับส่วนใหญ่อยู่ในระดับน้อย ร้อยละ 56.1 โดยสาเหตุของผลกระทบส่วนใหญ่ระบุว่าเป็นจากโรงงานโรงงานข้างเคียง ร้อยละ 56.1

ตารางที่ 6 ความคิดเห็นของผู้ให้สัมภาษณ์ต่อปัญหาความเดือดร้อน/ความรำคาญด้านสิ่งแวดล้อมที่ได้รับในปัจจุบัน

ผลกระทบ	ไม่มี (ร้อยละ)	มี (ร้อยละ)	ระดับผลกระทบ (ร้อยละ)			สาเหตุของผลกระทบ
			น้อย	ปานกลาง	มาก	
1. ฝุ่นละออง*	0.8	99.2	28.2	71.5	0.3	- การจราจร (81.3%) - โรงงานข้างเคียง (18.7%)
2. ครว/เขม่า***	72.7	27.3	56.1	43.9	0.0	- โรงงานข้างเคียง (56.1%) - การจราจร (43.0%) - ชุมชน (0.9%)
3. กลิ่นเหม็น	75.3	24.7	61.9	38.1	0.0	- โรงงานข้างเคียง (48.5%) - ชุมชน (32.0%) - น้ำเสีย (12.4%) - ขยะ (7.2%)
4. เสียงดัง**	62.0	38.0	55.7	44.3	0.0	- การจราจร (68.5%) - โรงงานข้างเคียง (20.8%) - ชุมชน (10.7%)
5. ความสั่นสะเทือน	99.7	0.3	100.0	0.0	0.0	- การจราจร (100.0%)
6. ขยะมูลฝอยตกค้าง	99.0	1.0	50.0	50.0	0.0	- ชุมชน (100.0%)
7. น้ำเสีย	96.4	3.6	78.6	21.4	0.0	- ชุมชน (71.4%) - โรงงานข้างเคียง (14.3%) - การระบายน้ำ (7.1%) - น้ำท่วมขัง (7.1%)

ตารางที่ 6 (ต่อ) ความคิดเห็นของผู้ให้สัมภาษณ์ต่อปัญหาความเดือดร้อน/ความรำคาญด้านสิ่งแวดล้อมที่ได้รับในปัจจุบัน

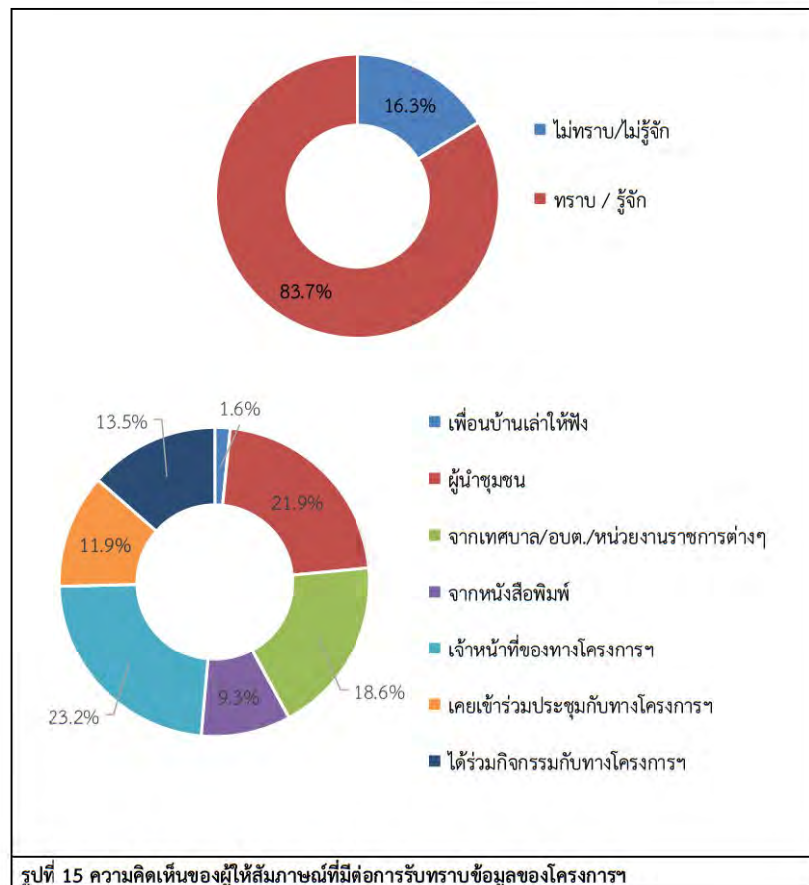
ผลกระทบ	ไม่มี (ร้อยละ)	มี (ร้อยละ)	ระดับผลกระทบ (ร้อยละ)			สาเหตุของผลกระทบ
			น้อย	ปานกลาง	มาก	
8. น้ำทิ้ง	89.0	11.0	86.0	14.0	0.0	- ชุมชน (53.5%) - การระบายน้ำ (46.5%)
9. น้ำท่วมขัง	68.9	31.1	58.2	41.8	0.0	- การระบายน้ำ (55.7%) - ปริมาณน้ำฝน (43.4%) - ชุมชน (0.8%)
10. ดินเสื่อมคุณภาพ	99.5	0.5	50.0	50.0	0.0	- การจราจร (50.0%) - โรงงานข้างเคียง (50.0%)
11. ถนนชำรุด/การคมนาคมไม่สะดวก	82.7	17.3	57.4	42.6	0.0	- การจราจร (100.0%)
12. การจราจร/อุบัติเหตุ	87.8	12.2	50.0	50.0	0.0	- การจราจร (83.3%) - ชุมชน (16.7%)
13. การขาดแคลนน้ำใช้	100.0	0.0	0.0	0.0	0.0	
14. การรั่วไหลของสารเคมี/ก๊าซธรรมชาติ	100.0	0.0	0.0	0.0	0.0	
15. การเกิดเพลิงไหม้/การระเบิด	100.0	0.0	0.0	0.0	0.0	

หมายเหตุ : \*, \*\*, \*\*\* หมายถึง ลำดับความคิดเห็นของผู้ให้สัมภาษณ์

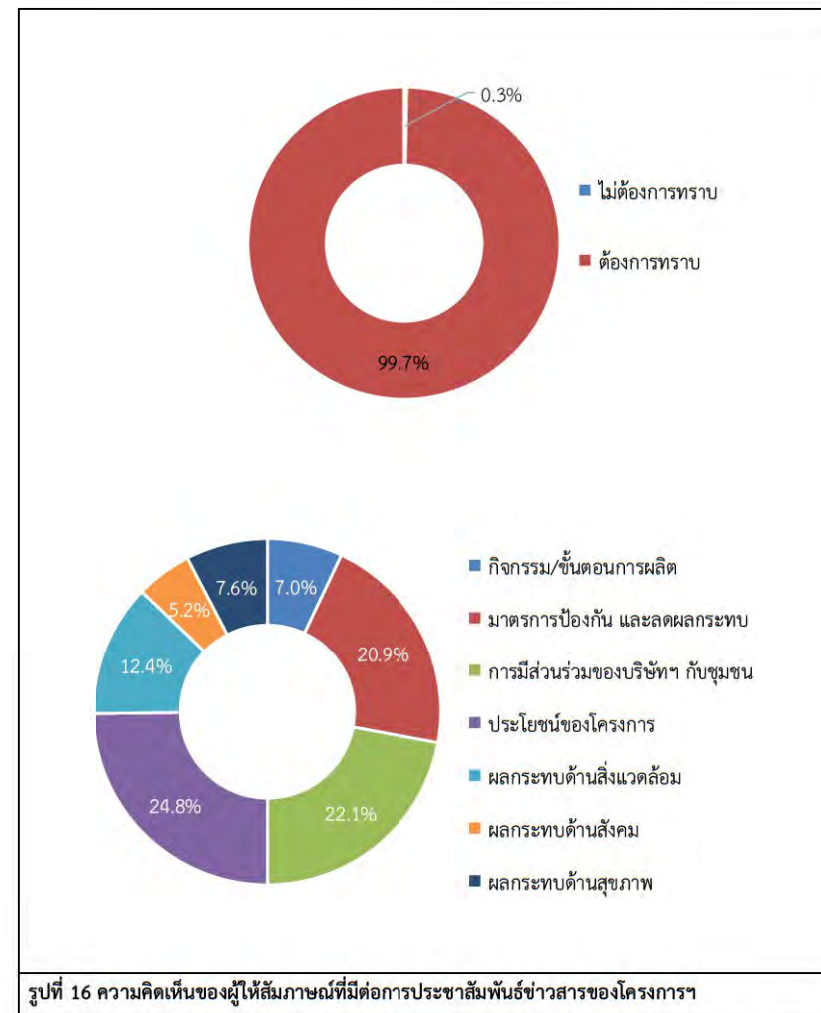
ที่มา : รวบรวมโดยบริษัท เอแอลเอส แลบริเอทอรี่ กรุ๊ป (ประเทศไทย) จำกัด, 2567

### 5) การรับทราบข้อมูล/ข่าวสาร และการมีส่วนร่วมกิจกรรมของโรงไฟฟ้า

ความคิดเห็นเกี่ยวกับโครงการโรงไฟฟ้าแก่งคอย 2 ของบริษัท แก่งคอย เพาเวอร์ เจเนอเรชั่น จำกัด พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่ทราบ/รู้จักโรงไฟฟ้า ร้อยละ 83.7 รองลงมาที่ไม่ทราบ/รู้จักโรงไฟฟ้า ร้อยละ 16.3 ส่วนผู้ให้สัมภาษณ์ที่ระบุว่า ทราบนั้นโดย 3 อันดับแรก ทราบจากเจ้าหน้าที่ของทางโครงการฯ ร้อยละ 23.2 รองลงมาทราบจากผู้นำชุมชน ร้อยละ 21.9 และทราบจากจากเทศบาล/อบต./หน่วยงานราชการต่างๆ ร้อยละ 18.6 โดยมีรายละเอียดดังรูปที่ 15

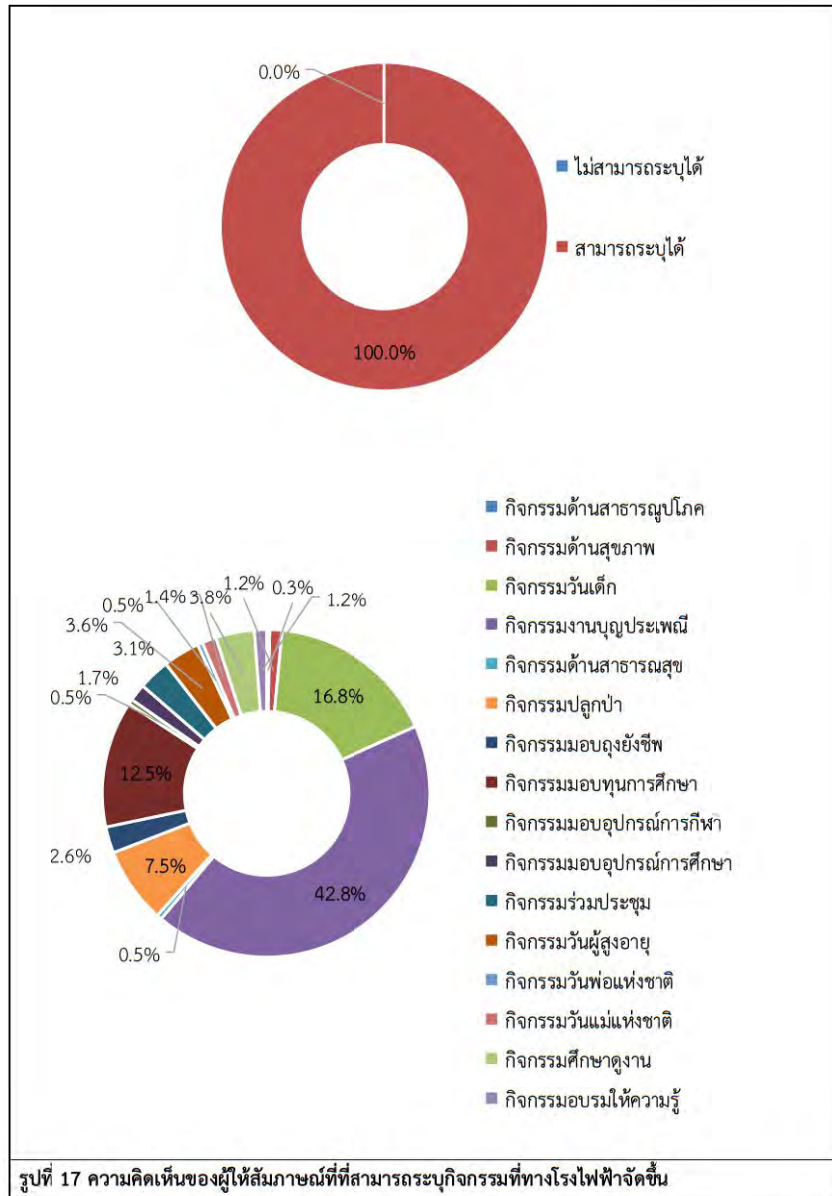


สำหรับข้อมูลการประชาสัมพันธ์ข่าวสารของโรงไฟฟ้าฯ พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่ต้องการรับทราบข้อมูล/ข่าวสารเกี่ยวกับโรงไฟฟ้าฯ ร้อยละ 99.7 และไม่ต้องการทราบ ร้อยละ 0.3 ทั้งนี้ข้อมูลให้ผู้ให้สัมภาษณ์ต้องการให้มีการประชาสัมพันธ์เพิ่มเติมโดย 3 อันดับแรก ประโยชน์ของโครงการ ร้อยละ 24.8 รองลงมา ต้องการทราบการมีส่วนร่วมของบริษัทฯ กับชุมชน ร้อยละ 22.1 และต้องการทราบมาตรการป้องกัน และลดผลกระทบ ร้อยละ 20.9 ตามลำดับ โดยมีรายละเอียดดังรูปที่ 16

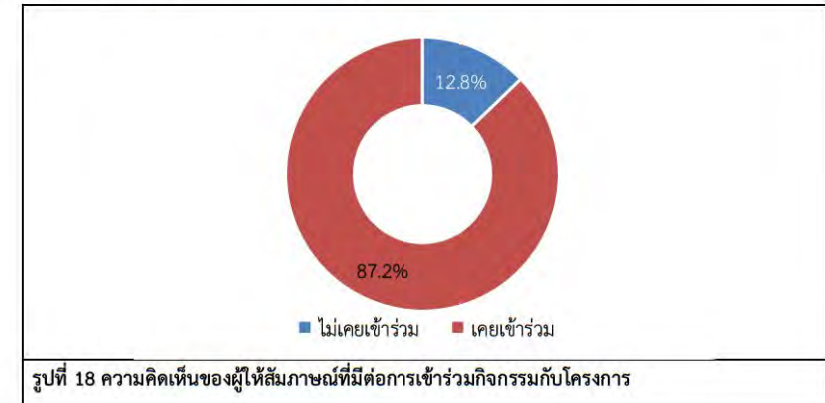


สำหรับกิจกรรมที่โรงไฟฟ้าฯ จัดขึ้น พบว่าผู้ให้สัมภาษณ์ทั้งหมดสามารถระบุกิจกรรมที่โรงไฟฟ้าฯ จัดขึ้นได้ เมื่อสอบถามถึงการเข้าร่วมกิจกรรมกับทางโรงไฟฟ้าฯ ผู้ให้สัมภาษณ์ทั้งหมดระบุว่า เคยเข้าร่วมกิจกรรมกับโรงไฟฟ้าฯ โดยผู้ให้สัมภาษณ์ที่ระบุว่า เคยเข้าร่วมกิจกรรม 3 อันดับแรก กิจกรรมงานบุญประเพณี ร้อยละ 42.8 รองลงมา กิจกรรมวันเด็ก ร้อยละ 16.8 และกิจกรรมมอบทุนการศึกษา ร้อยละ 12.5 ตามลำดับ โดยมีรายละเอียดดังรูปที่ 17





สำหรับช่วงที่ผ่านมารการเข้าร่วมกิจกรรมกับทางโรงไฟฟ้า ๆ พบว่าผู้ให้สัมภาษณ์ส่วนใหญ่ระบุว่าเคยเข้าร่วมกิจกรรมกับทางโรงไฟฟ้า ๆ ร้อยละ 87.2 รองลงมา รองลงมาไม่เคยเข้าร่วมกิจกรรมกับทางโรงไฟฟ้า ร้อยละ 12.8 โดยผู้ให้สัมภาษณ์ที่เคยเข้าร่วมกิจกรรมระบุเหตุผล สนใจกิจกรรม ร้อยละ 61.2 รองลงมาสะดวกเข้าร่วมกิจกรรม ร้อยละ 16.1 ส่วนผู้ให้สัมภาษณ์ที่ไม่เคยเข้าร่วมกิจกรรมระบุเหตุผลว่า ไม่สะดวก ร้อยละ 97.6 และ ไม่สนใจกิจกรรม ร้อยละ 2.4 โดยมีรายละเอียดดังรูปที่ 18



เมื่อสอบถามถึงการรู้จักกิจกรรมที่โรงไฟฟ้าฯ จัดขึ้น ซึ่งมีรายละเอียดดังตารางที่ 7 โดยสามารถสรุปได้ดังนี้

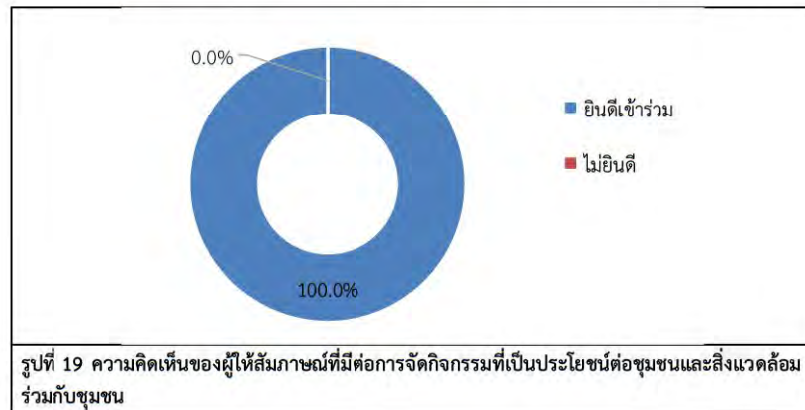
- **กิจกรรมร่วมประชุม** พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่รู้จักกิจกรรม ร้อยละ 92.4 รองลงมาไม่รู้จักกิจกรรม ร้อยละ 7.6 ซึ่งผู้ให้สัมภาษณ์ทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- **กิจกรรมศึกษาดูงาน** พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่รู้จักกิจกรรม ร้อยละ 83.2 รองลงมาไม่รู้จักกิจกรรม ร้อยละ 16.8 ซึ่งผู้ให้สัมภาษณ์ทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- **กิจกรรมมอบความรู้** พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่รู้จักกิจกรรม ร้อยละ 86.6 รองลงมาไม่รู้จักกิจกรรม ร้อยละ 13.4 ซึ่งผู้ให้สัมภาษณ์ทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- **กิจกรรมให้ทุนการศึกษานักเรียน** พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่รู้จักกิจกรรม ร้อยละ 98.5 รองลงมาไม่รู้จักกิจกรรม ร้อยละ 1.5 ซึ่งผู้ให้สัมภาษณ์ทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- **กิจกรรมวันเด็ก** พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่รู้จักกิจกรรม ร้อยละ 97.9 รองลงมาไม่รู้จักกิจกรรม ร้อยละ 2.1 ซึ่งผู้ให้สัมภาษณ์ทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- **สนับสนุนกิจกรรมในชุมชน** พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่รู้จักกิจกรรม ร้อยละ 90.2 รองลงมาไม่รู้จักกิจกรรม ร้อยละ 9.8 ซึ่งผู้ให้สัมภาษณ์ทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- **กิจกรรมด้านสิ่งแวดล้อม** พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่รู้จักกิจกรรม ร้อยละ 82.9 รองลงมาไม่รู้จักกิจกรรม ร้อยละ 17.1 ซึ่งผู้ให้สัมภาษณ์ทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- **กิจกรรมชุมชนสัมพันธ์** พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่รู้จักกิจกรรม ร้อยละ 80.2 รองลงมาไม่รู้จักกิจกรรม ร้อยละ 19.8 ซึ่งผู้ให้สัมภาษณ์ทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง
- **กิจกรรมตรวจสอบสุขภาพ** พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่รู้จักกิจกรรม ร้อยละ 82.9 รองลงมาไม่รู้จักกิจกรรม ร้อยละ 17.1 ซึ่งผู้ให้สัมภาษณ์ทั้งหมด ต้องการให้ดำเนินการต่อเนื่อง

#### ตารางที่ 7 ความเห็นของผู้ให้สัมภาษณ์ต่อการรู้จักกิจกรรมที่โรงไฟฟ้า จัดขึ้น

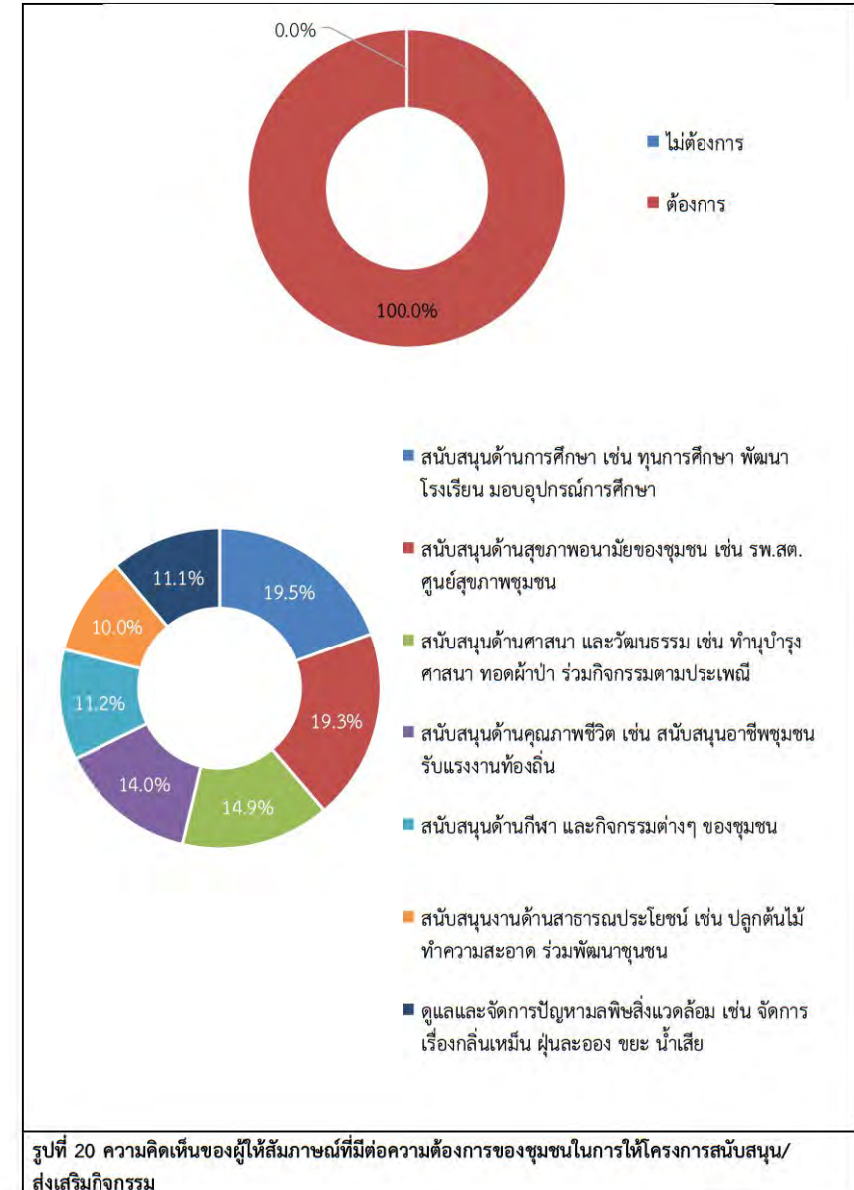
กิจกรรมที่โรงไฟฟ้า จัดขึ้น	การรู้จัก		ความต้องการให้ดำเนินการต่อเนื่อง	
	ไม่รู้จัก	รู้จัก	ไม่ต้องการ	ต้องการ
1. กิจกรรมร่วมประชุม	7.6	92.4	0.0	100.0
2. กิจกรรมศึกษาดูงาน	16.8	83.2	0.0	100.0
3. กิจกรรมอบรมให้ความรู้	13.4	86.6	0.0	100.0
4. กิจกรรมให้ทุนการศึกษานักเรียน	1.5	98.5	0.0	100.0
5. กิจกรรมวันเด็ก	2.1	97.9	0.0	100.0
6. สนับสนุนกิจกรรมในชุมชน	9.8	90.2	0.0	100.0
7. กิจกรรมด้านสิ่งแวดล้อม	17.1	82.9	0.0	100.0
8. กิจกรรมชุมชนสัมพันธ์	19.8	80.2	0.0	100.0
9. กิจกรรมตรวจสอบสุขภาพ	17.1	82.9	0.0	100.0

ที่มา : รวบรวมโดยบริษัท เอแอลเอส แลบบอราทอรี กรุ๊ป (ประเทศไทย) จำกัด, 2567

เมื่อสอบถามผู้ให้สัมภาษณ์ว่าหากโครงการโรงไฟฟ้า จัดกิจกรรมที่เป็นประโยชน์ต่อชุมชนและสิ่งแวดล้อมร่วมกับชุมชน พบว่าผู้ให้สัมภาษณ์ทั้งหมดระบุว่า ยินดีเข้าร่วมเข้าร่วม โดยมีรายละเอียดดังรูปที่ 19



ผู้ให้สัมภาษณ์ทั้งหมดระบุว่าหากทางโรงไฟฟ้า จัดกิจกรรมร่วมกับชุมชนยินดีเข้าร่วมกิจกรรมสำหรับความต้องการของชุมชนในการให้โรงไฟฟ้าสนับสนุน/ส่งเสริมกิจกรรม พบว่า ผู้ให้สัมภาษณ์ทั้งหมดต้องการให้ทางโรงไฟฟ้า ส่งเสริมกิจกรรม ซึ่งผู้ให้สัมภาษณ์ส่วนใหญ่โดย 3 อันดับแรก ต้องการให้สนับสนุนด้านการศึกษา เช่น ทุนการศึกษา พัฒนาโรงเรียน มอบอุปกรณ์การศึกษา ร้อยละ 19.5 รองลงมาต้องการให้สนับสนุนด้านสุขภาพอนามัยของชุมชน เช่น รพ.สต. ศูนย์สุขภาพชุมชน ร้อยละ 19.3 และต้องการให้สนับสนุนด้านศาสนา และวัฒนธรรม เช่น ทำนุบำรุงศาสนา ทอดผ้าป่า ร่วมกิจกรรมตามประเพณี ร้อยละ 14.9 ตามลำดับ โดยมีรายละเอียดดังรูปที่ 20



รูปที่ 20 ความคิดเห็นของผู้ให้สัมภาษณ์ที่มีต่อความต้องการของชุมชนในการให้โครงการสนับสนุน/ส่งเสริมกิจกรรม



6.1) ผลดีและผลเสียที่ได้รับจากการดำเนินการของโรงไฟฟ้าฯ สามารถสรุปได้ดังนี้

รายละเอียดดังรูปที่ 21 โดยสามารถสรุปผลได้ดังนี้

- 
- | Response  | Percentage |
|---|------------|
| การจรรยาบรรณลดภัยมากขึ้น                                  | 0.3%       |
| กิจกรรมมีประโยชน์และสนับสนุนการมีส่วนร่วมของโรงไฟฟ้าชุมชน | 0.3%       |
| ขยายโอกาสการทำธุรกิจเกี่ยวกับพลังงาน                      | 0.6%       |
| ช่วยเพิ่มคุณภาพระบบสาธารณสุขภูมิภาคในชุมชน                | 0.6%       |
| ทำให้สิ่งแวดล้อมในชุมชนมีความพัฒนามากขึ้น                 | 0.9%       |
| เพิ่มการเข้าถึงเทคโนโลยีในชุมชน                           | 0.9%       |
| เพิ่มโอกาสสร้างธุรกิจในพื้นที่                            | 0.9%       |
| มีการลงทุนในชุมชนเพิ่มขึ้น                                | 0.9%       |
| โรงไฟฟ้าสร้างความร่วมมือในชุมชน                           | 0.9%       |
| ลดปัญหาการว่างงานในชุมชน                                  | 1.2%       |
| ส่งเสริมการท่องเที่ยวในชุมชน                              | 1.2%       |
| ส่งเสริมความเป็นอยู่ที่ดีในชุมชน                          | 1.2%       |
| ส่งเสริมเศรษฐกิจในชุมชน                                   | 1.2%       |
| สร้างความยั่งยืนในการพัฒนาชุมชน                           | 1.2%       |
| สิ่งแวดล้อมในชุมชนมีการพัฒนามากขึ้น                       | 1.2%       |
| การปลูกต้นไม้เพิ่มพื้นที่สีเขียวในชุมชน                   | 1.2%       |
| เกิดรายได้หมุนเวียนในชุมชน                                | 1.2%       |
| ช่วยเพิ่มการเข้าถึงไฟฟ้าในพื้นที่ชนบท                     | 1.2%       |
| ช่วยลดภาระค่าพลังงานในครัวเรือน                           | 1.2%       |
| พัฒนาสุขภาพและความปลอดภัยในชุมชน                          | 1.2%       |
| เพิ่มความปลอดภัยด้านพลังงาน                               | 1.2%       |
| มีกองทุนพัฒนาไฟฟ้า  | 1.2%       |
| มีไฟฟ้าส่องสว่างตลอดทาง                                   | 1.2%       |
| ลดการพึ่งพาพลังงานจากที่อื่น                              | 1.2%       |
| เศรษฐกิจในชุมชนดีขึ้น                                     | 1.2%       |
| ส่งเสริมการพัฒนาพื้นที่ชนบท                               | 1.2%       |
| ส่งเสริมด้านการศึกษา                                      | 1.2%       |
| ส่งเสริมให้เยาวชนใส่ใจด้านพลังงาน                         | 1.2%       |
| สร้างโอกาสในการพัฒนาอาชีพ                                 | 1.2%       |
| การจรรยาบรรณลดภัยมากขึ้น                                  | 1.2%       |
| กิจกรรมมีประโยชน์และสนับสนุนการมีส่วนร่วมของโรงไฟฟ้าชุมชน | 1.2%       |
| ขยายโอกาสการทำธุรกิจเกี่ยวกับพลังงาน                      | 1.2%       |
| ช่วยเพิ่มคุณภาพระบบสาธารณสุขภูมิภาคในชุมชน                | 1.2%       |
| ทำให้สิ่งแวดล้อมในชุมชนมีความพัฒนามากขึ้น                 | 1.2%       |
| เพิ่มการเข้าถึงเทคโนโลยีในชุมชน                           | 1.2%       |
| เพิ่มโอกาสสร้างธุรกิจในพื้นที่                            | 1.2%       |
| มีการลงทุนในชุมชนเพิ่มขึ้น                                | 1.2%       |
| โรงไฟฟ้าสร้างความร่วมมือในชุมชน                           | 1.2%       |
| ลดปัญหาการว่างงานในชุมชน                                  | 1.2%       |
| ส่งเสริมการท่องเที่ยวในชุมชน                              | 1.2%       |
| ส่งเสริมความเป็นอยู่ที่ดีในชุมชน                          | 1.2%       |
| ส่งเสริมเศรษฐกิจในชุมชน                                   | 1.2%       |
| สร้างความยั่งยืนในการพัฒนาชุมชน                           | 1.2%       |
| สิ่งแวดล้อมในชุมชนมีการพัฒนามากขึ้น                       | 1.2%       |
| การปลูกต้นไม้เพิ่มพื้นที่สีเขียวในชุมชน                   | 1.2%       |
| เกิดรายได้หมุนเวียนในชุมชน                                | 1.2%       |
| ช่วยเพิ่มการเข้าถึงไฟฟ้าในพื้นที่ชนบท                     | 1.2%       |
| ช่วยลดภาระค่าพลังงานในครัวเรือน                           | 1.2%       |
| พัฒนาสุขภาพและความปลอดภัยในชุมชน                          | 1.2%       |
| เพิ่มความปลอดภัยด้านพลังงาน                               | 1.2%       |
| มีกองทุนพัฒนาไฟฟ้า  | 1.2%       |
| มีไฟฟ้าส่องสว่างตลอดทาง                                   | 1.2%       |
| ลดการพึ่งพาพลังงานจากที่อื่น                              | 1.2%       |
| เศรษฐกิจในชุมชนดีขึ้น                                     | 1.2%       |
| ส่งเสริมการพัฒนาพื้นที่ชนบท                               | 1.2%       |
| ส่งเสริมด้านการศึกษา                                      | 1.2%       |
| ส่งเสริมให้เยาวชนใส่ใจด้านพลังงาน                         | 1.2%       |
| สร้างโอกาสในการพัฒนาอาชีพ                                 | 1.2%       |

รูปที่ 21 ความคิดเห็นของผู้ให้สัมภาษณ์ที่มีต่อผลผลิตที่ได้รับจากการดำเนินการของโรงไฟฟ้าฯ

6.2) ความพึงพอใจต่อการดูแลสังคมที่ผ่านมา ซึ่งมีรายละเอียดดังตารางที่ 8 โดยสามารถสรุปได้ดังนี้

- ด้านความปลอดภัยจากการดำเนินงาน พบว่า ผู้ให้สัมภาษณ์มีความพึงพอใจในระดับมาก ร้อยละ 50.6 รองลงมาพึงพอใจในระดับปานกลาง ร้อยละ 47.3 และพึงพอใจในระดับมากที่สุด ร้อย 2.1 มีค่าเฉลี่ยความพึงพอใจอยู่ในระดับมาก ( $\bar{x} = 3.55$ )
- ด้านสังคม พบว่า ผู้ให้สัมภาษณ์มีความพึงพอใจในระดับมาก ร้อยละ 64.4 รองลงมาพึงพอใจในระดับปานกลาง ร้อยละ 33.8 และพึงพอใจในระดับมากที่สุด ร้อยละ 1.8 มีค่าเฉลี่ยความพึงพอใจอยู่ในระดับมาก ( $\bar{x} = 3.68$ )
- ด้านสิ่งแวดล้อม พบว่า ผู้ให้สัมภาษณ์มีความพึงพอใจในระดับมาก ร้อยละ 54.3 รองลงมาพึงพอใจในระดับปานกลาง ร้อยละ 37.5 และพึงพอใจในระดับมากที่สุด ร้อยละ 8.2 มีค่าเฉลี่ยความพึงพอใจอยู่ในระดับมาก ( $\bar{x} = 3.71$ )
- ด้านกิจกรรมชุมชนสัมพันธ์/การมีส่วนร่วม พบว่า ผู้ให้สัมภาษณ์มีความพึงพอใจในระดับมาก ร้อยละ 43.9 รองลงมาพึงพอใจในระดับปานกลาง ร้อยละ 35.7 และพึงพอใจในระดับมากที่สุด ร้อยละ 20.4 มีค่าเฉลี่ยความพึงพอใจอยู่ในระดับมาก ( $\bar{x} = 3.85$ )
- ด้านการดูแลสุขภาพของประชาชน พบว่า ผู้ให้สัมภาษณ์มีความพึงพอใจในระดับมาก ร้อยละ 43.7 รองลงมาพึงพอใจในระดับปานกลาง ร้อยละ 43.5 และพึงพอใจในระดับมากที่สุด ร้อยละ 12.5 มีค่าเฉลี่ยความพึงพอใจอยู่ในระดับมาก ( $\bar{x} = 3.69$ )
- การเปิดเผยข้อมูล พบว่า ผู้ให้สัมภาษณ์มีความพึงพอใจในระดับปานกลาง ร้อยละ 54.0 รองลงมาพึงพอใจในระดับมาก ร้อยละ 39.9 และพึงพอใจในระดับมากที่สุด ร้อยละ 5.8 มีค่าเฉลี่ยความพึงพอใจอยู่ในระดับมาก ( $\bar{x} = 3.51$ )

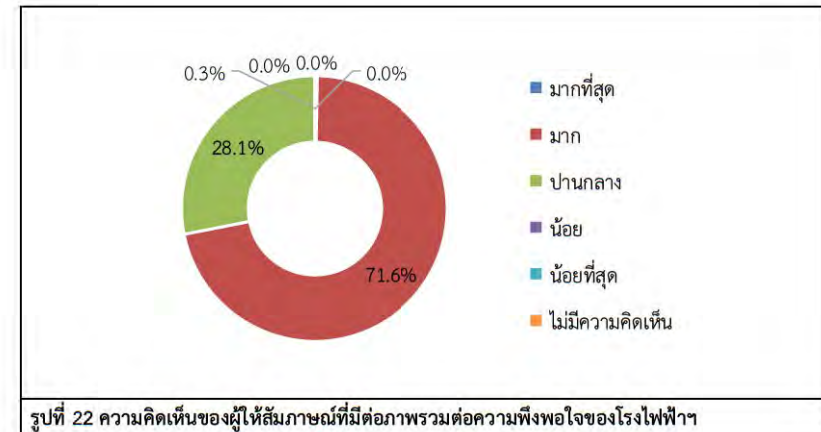
ตารางที่ 8 ความเห็นของผู้ให้สัมภาษณ์ต่อความพึงพอใจต่อการดูแลสังคมของโรงไฟฟ้า

การดูแลสังคม	ระดับความพึงพอใจ					ค่าเฉลี่ย $\bar{x}$	แปลผล <sup>1/</sup>
	น้อยที่สุด	น้อย	ปานกลาง	มาก	มากที่สุด		
1. ด้านความปลอดภัยในกระบวนการผลิต	0.0	0.0	47.3	50.6	2.1	3.55	มาก
2. ด้านสังคม	0.0	0.0	33.8	64.4	1.8	3.68	มาก
3. ด้านสิ่งแวดล้อม	0.0	0.0	37.5	54.3	8.2	3.71	มาก
4. ด้านกิจกรรมชุมชนสัมพันธ์/การมีส่วนร่วม	0.0	0.0	35.7	43.9	20.4	3.85	มาก
5. ด้านการดูแลสุขภาพของประชาชน	0.0	0.0	43.5	43.7	12.5	3.69	มาก
6. การเปิดเผยข้อมูล	0.0	0.0	54.0	39.9	5.8	3.51	มาก

หมายเหตุ : <sup>1/</sup>การแปลผลค่าเฉลี่ย 1.00 - 1.50 = น้อยที่สุด  
1.51 - 2.50 = น้อย  
2.51 - 3.50 = ปานกลาง  
3.51 - 4.50 = มาก  
4.51 - 5.00 = มากที่สุด

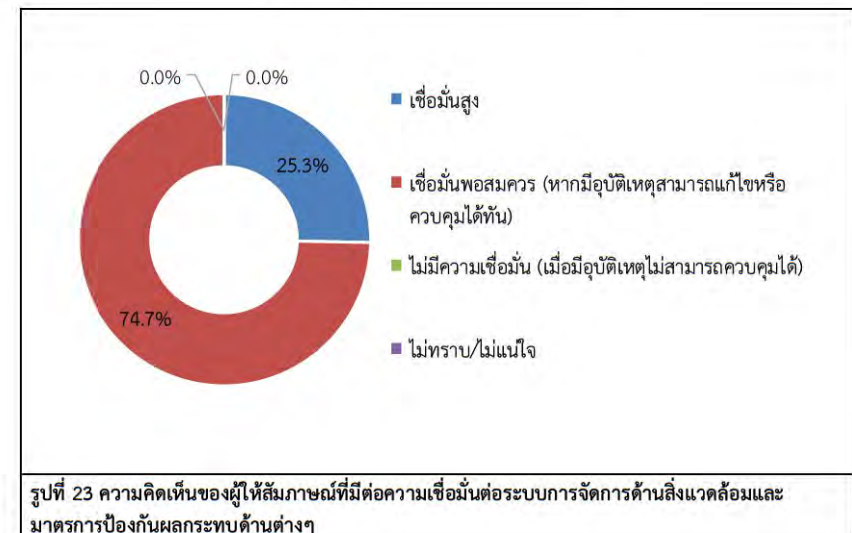
ที่มา : รวบรวมโดยบริษัท เอแอลเอส แลบริทอรี่ กรุ๊ป (ประเทศไทย) จำกัด, 2567

สำหรับความคิดเห็นในภาพรวมต่อความพึงพอใจของโรงไฟฟ้า พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่มีความพึงพอใจในระดับมาก ร้อยละ 71.6 รองลงมามีความพึงพอใจในระดับปานกลาง ร้อยละ 28.1 และพึงพอใจในระดับมากที่สุด ร้อยละ 0.3 โดยมีรายละเอียดดังรูปที่ 22



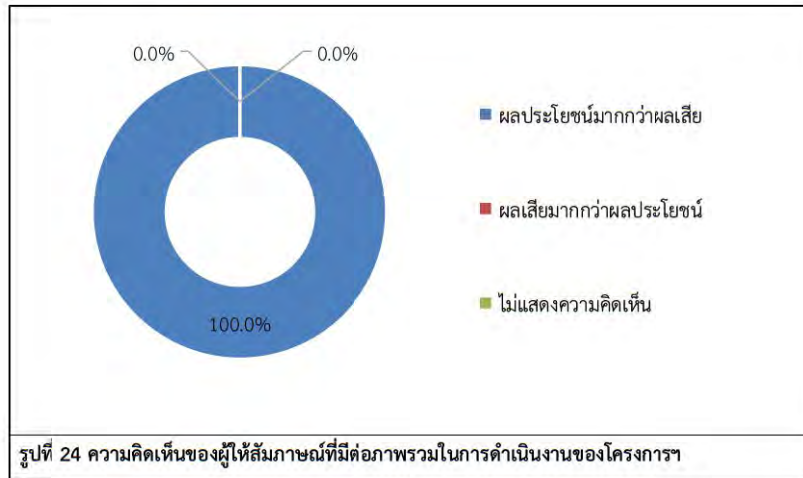
## 7) ความเชื่อมั่น และความคิดเห็นต่อโรงไฟฟ้า

ในด้านความเชื่อมั่นต่อระบบการจัดการด้านสิ่งแวดล้อมและมาตรการป้องกันผลกระทบด้านต่างๆ ของโรงไฟฟ้า พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่ระบุว่า เชื่อมั่นพอสมควร (หากมีอุบัติเหตุสามารถแก้ไขหรือควบคุมได้ทัน) ร้อยละ 74.7 รองลงมาระบุว่าเชื่อมั่นสูง ร้อยละ 25.3 โดยมีรายละเอียดดังรูปที่ 23





ความคิดเห็นในภาพรวมต่อการดำเนินงานของโรงไฟฟ้า ในปี พ.ศ. 2567 พบว่าผู้ให้สัมภาษณ์ทั้งหมดระบุว่า ผลประโยชน์มากกว่าผลเสีย โดยมีเหตุผล 3 อันดับแรก คนในชุมชนมีรายได้ ร้อยละ 22.6 รองลงมา สร้างงานสร้างอาชีพในชุมชน ร้อยละ 19.2 และมีงบประมาณมาพัฒนาชุมชน ร้อยละ 11.3 ตามลำดับ โดยมีรายละเอียดดังรูปที่ 24



สำหรับข้อเสนอแนะอื่นๆ ที่เกี่ยวกับโครงการฯ สามารถสรุปเป็นประเด็นสำคัญได้ดังนี้

- สนับสนุนกิจกรรมด้านสุขภาพและการกีฬา อาทิ การตรวจสุขภาพประจำปีและฉีดวัคซีนฟรีให้ประชาชน ร้อยละ 19.9
- มอบทุนด้านการศึกษาให้เด็ก ๆ ในชุมชน ร้อยละ 10.7
- จัดกิจกรรมปลูกป่าและฟื้นฟูทรัพยากรในท้องถิ่น ร้อยละ 10.4
- สนับสนุนเครื่องมือหรืออุปกรณ์ดูแลสุขภาพและผู้ป่วยติดเตียงในชุมชน ร้อยละ 7.5
- สนับสนุนงานฝีมือให้กับชาวบ้านในชุมชน ร้อยละ 6.8
- สนับสนุนด้านการท่องเที่ยว ร้อยละ 5.6
- อยากรู้เกี่ยวกับกิจกรรมและประชาสัมพันธ์โครงการบ่อย ๆ ร้อยละ 4.8
- สนับสนุนการติดตั้งกล้องวงจรปิดและป้ายจราจรเพื่อความปลอดภัยในชุมชน ร้อยละ 3.8
- สนับสนุนการเพิ่มอาชีพในชุมชน ร้อยละ 3.8
- สนับสนุนการฝึกอาชีพ และพัฒนาทักษะด้านอาชีพให้ชาวบ้าน ร้อยละ 3.4
- สนับสนุนเครื่องมือทางการแพทย์ให้กับโรงพยาบาล และอบรมการปฐมพยาบาลเบื้องต้น ร้อยละ 3.4
- จัดกิจกรรมสร้างความสามัคคีระหว่างชุมชน ร้อยละ 2.7
- สนับสนุนด้านศาสนาและวัฒนธรรม ร้อยละ 2.7
- จัดการเรื่องกลิ่นเหม็นของน้ำเสีย และฝุ่นละอองภายในชุมชน ร้อยละ 2.4

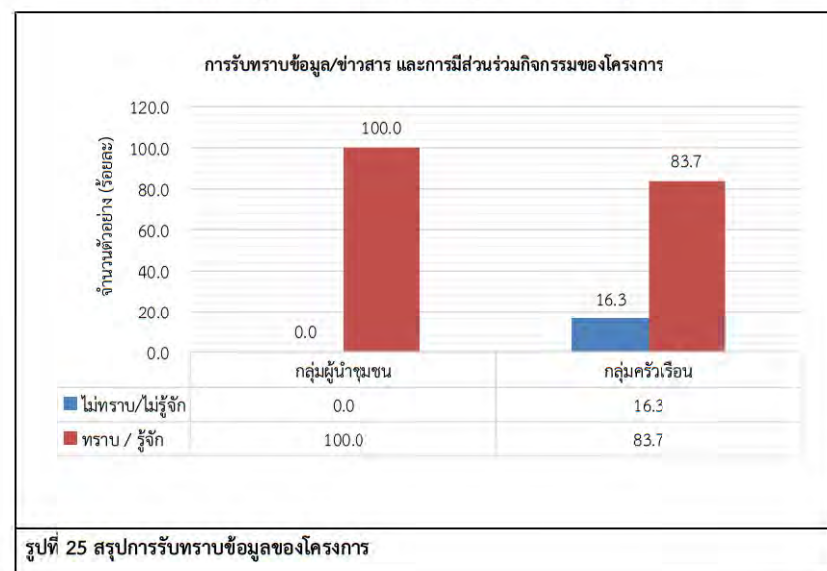
- กิจกรรมแลกเปลี่ยนภาษาหรือสอนภาษาให้เด็กในชุมชน ร้อยละ 1.4
- สนับสนุนการพัฒนาสาธารณูปโภคที่ยังขาดแคลน ร้อยละ 1.4
- การจัดกิจกรรมร่วมกับชุมชนมากขึ้น ร้อยละ 1.0
- มอบอาหารกลางวันเด็กเล็กในชุมชน ร้อยละ 1.0
- สนับสนุนการจัดโครงการเก็บขยะรีไซเคิลและบำบัดน้ำเสียในชุมชน ร้อยละ 1.0
- สนับสนุนการบริจาคเครื่องมือทางการแพทย์ให้กับโรงเรียนในพื้นที่ ร้อยละ 1.0
- สนับสนุนอุปกรณ์ออกกำลังกายในชุมชน ร้อยละ 1.0
- สนับสนุนการจัดกิจกรรมให้ความรู้ อาทิ ด้านโภชนาการ เทคโนโลยีพลังงาน ร้อยละ 0.7
- สนับสนุนการช่วยเหลือชุมชนในช่วงภัยพิบัติ ร้อยละ 0.7
- สนับสนุนการสร้างศูนย์ชุมชนสำหรับการจัดกิจกรรม ร้อยละ 0.7
- สนับสนุนกิจกรรมอุดหนุนชุดหินปูนฟรีให้เด็กและชาวบ้านในชุมชน ร้อยละ 0.7
- สนับสนุนการจัดโครงการรณรงค์ต่อต้านยาเสพติดในชุมชน ร้อยละ 0.3
- สนับสนุนโครงการออมทรัพย์ให้ชุมชน ร้อยละ 0.3
- สนับสนุนงบประมาณในการนำมาพัฒนาชุมชน ร้อยละ 0.3
- สนับสนุนด้านการเพิ่มรายได้ในชุมชน ร้อยละ 0.3
- สนับสนุนผลผลิตการเกษตร ร้อยละ 0.3

## 8. สรุปผลการศึกษา

จากการดำเนินการสำรวจทัศนคติชุมชนที่มีต่อโครงการโรงไฟฟ้าแก่งคอย 2 ระหว่างวันที่ 10-11 ตุลาคม 2567 ในชุมชนที่อยู่บริเวณพื้นที่ศึกษาโดยรอบรัศมี 5 กิโลเมตร จำนวน 2 ตัวอย่าง ประกอบด้วย กลุ่มผู้นำชุมชน จำนวน 34 ตัวอย่าง และกลุ่มครัวเรือน จำนวน 392 ตัวอย่าง โดยสรุปผลการศึกษาได้ดังนี้โดยสรุปผลการศึกษาได้ดังนี้

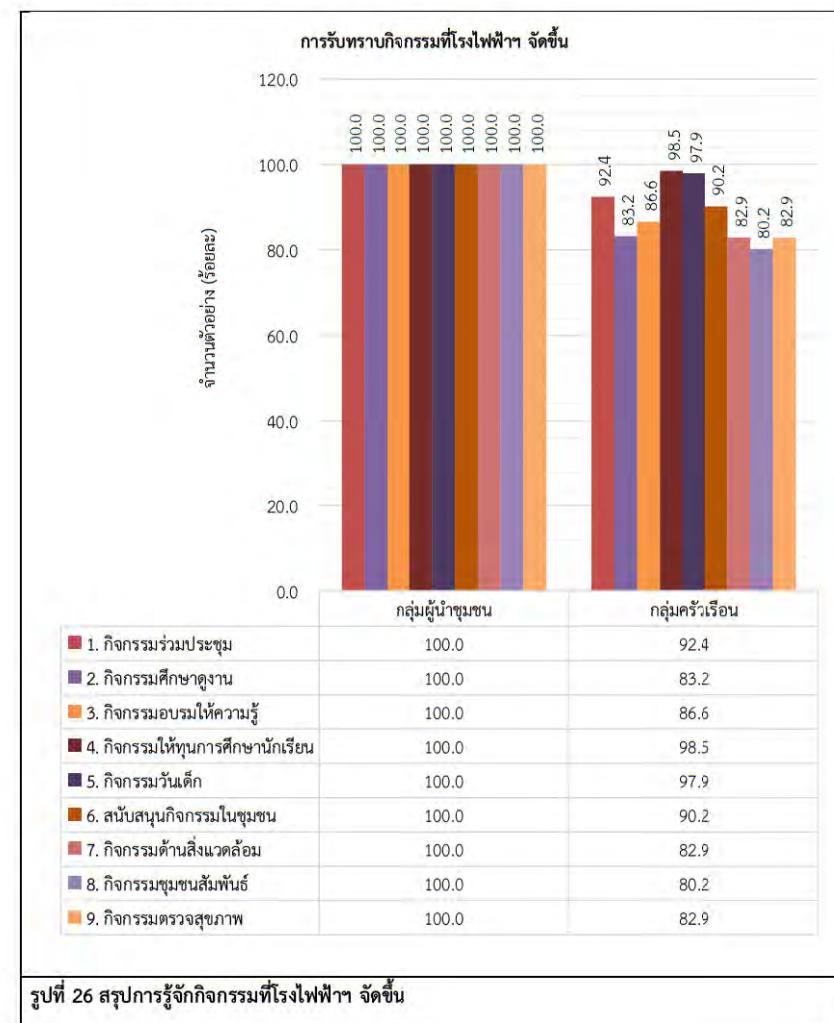
### 8.1 การรับทราบข้อมูลของโครงการ มีรายละเอียดดังรูปที่ 25 โดยสามารถสรุปได้ดังนี้

- กลุ่มผู้นำชุมชน พบว่า ผู้นำชุมชนทั้งหมดทราบ/รู้จักโครงการ
- กลุ่มครัวเรือน ผู้ให้สัมภาษณ์ส่วนใหญ่ทราบ/รู้จักโครงการ มากที่สุด ร้อยละ 83.7



### 8.2 การรู้จักกิจกรรมที่โรงไฟฟ้า จัดขึ้น มีรายละเอียดดังรูปที่ 26 โดยสามารถสรุปได้ดังนี้

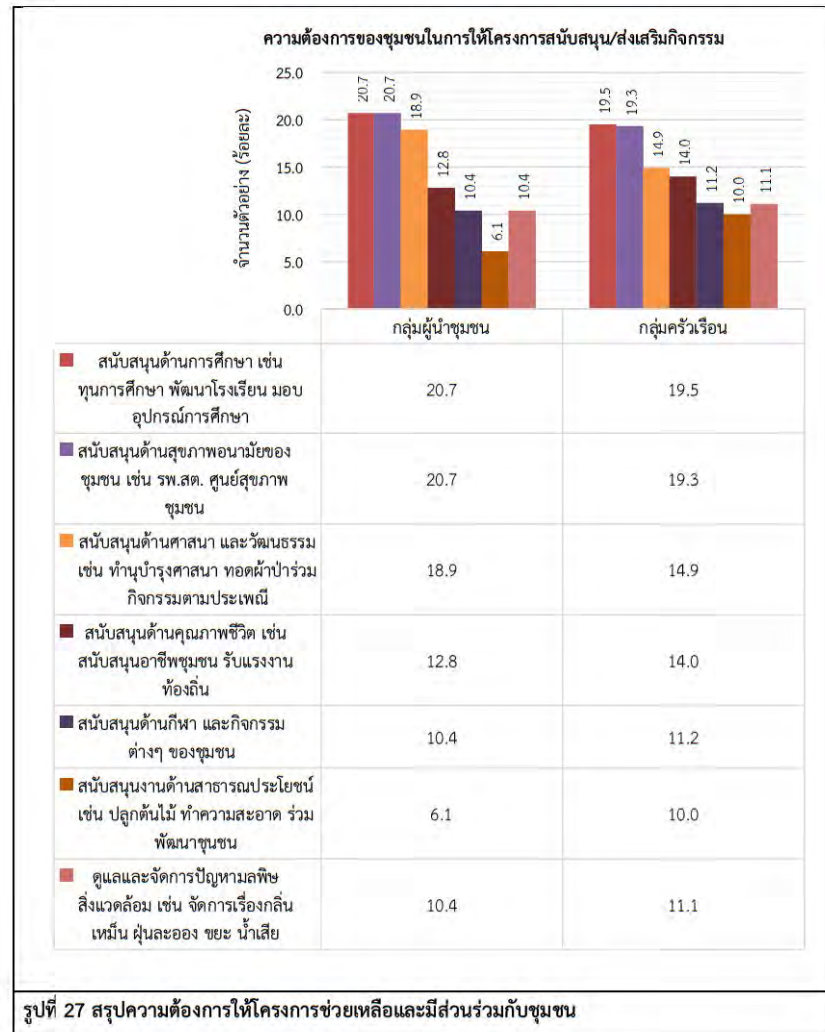
- กลุ่มผู้นำชุมชน พบว่า ผู้นำชุมชนทั้งหมดรู้จักกิจกรรมในทุกๆกิจกรรมที่โรงไฟฟ้า จัดขึ้น
- กลุ่มครัวเรือน พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่รู้จักกิจกรรมที่โรงไฟฟ้า จัดขึ้น โดย 3 กิจกรรมที่ผู้ให้สัมภาษณ์รู้จักมากที่สุดคือ กิจกรรมให้ทุนนักเรียนนักเรียน ร้อยละ 98.5 รองลงมากิจกรรมวันเด็ก ร้อยละ 97.9 และกิจกรรมร่วมประชุม ร้อยละ 92.4 ตามลำดับ





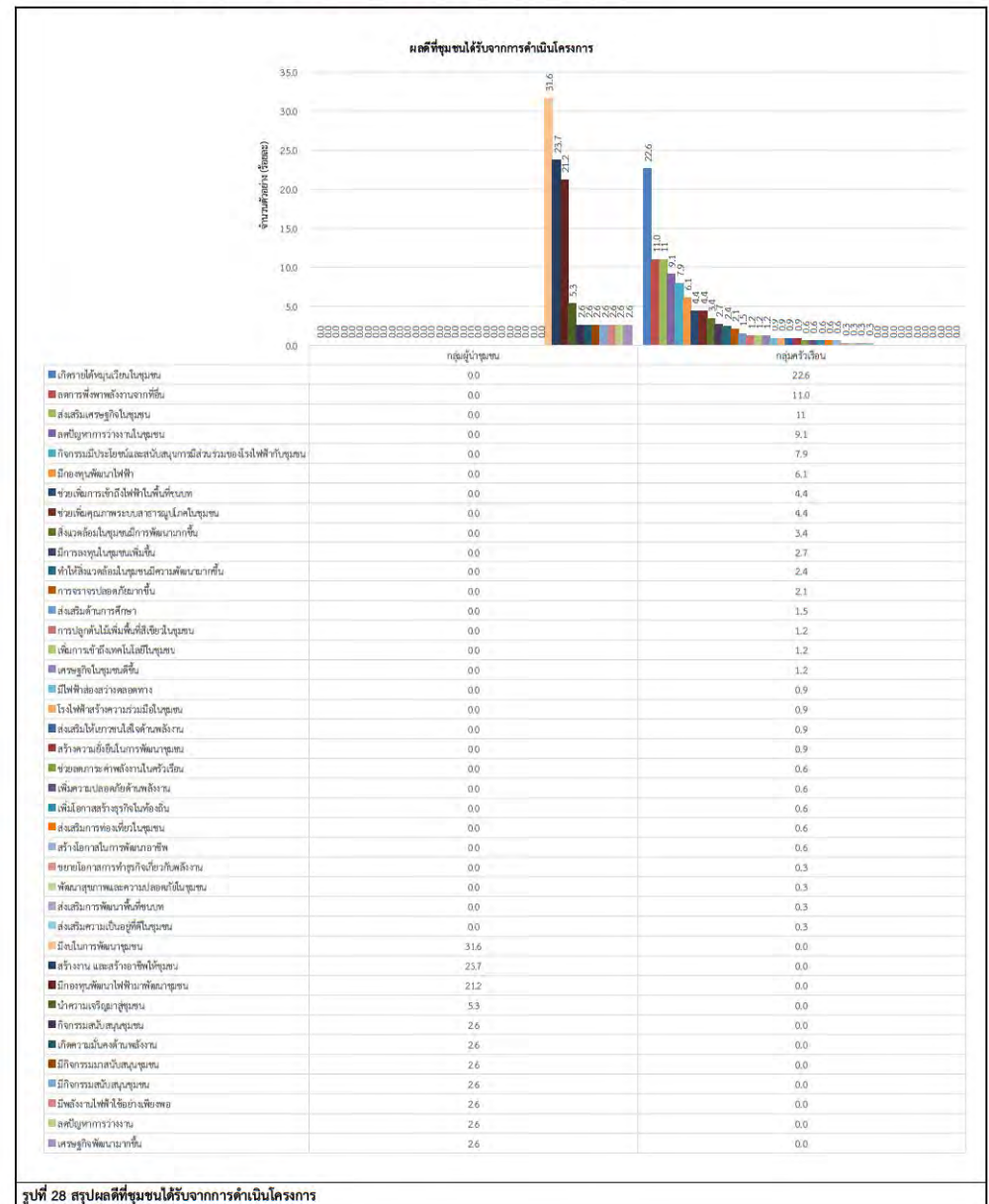
8.3 ความต้องการให้โครงการช่วยเหลือและมีส่วนร่วมกับชุมชน มีรายละเอียดดังรูปที่ 27 โดยสามารถสรุปได้ดังนี้

- กลุ่มผู้นำชุมชน พบว่า ผู้นำชุมชนส่วนใหญ่ต้องการให้สนับสนุนด้านการศึกษา เช่นทุนการศึกษา พัฒนาโรงเรียน มอบอุปกรณ์การศึกษา และสนับสนุนด้านสุขภาพอนามัยของชุมชน เช่น รพ.สต. ศูนย์สุขภาพชุมชนมากที่สุด ร้อยละ 20.7 สัดส่วนที่เท่ากัน
- กลุ่มครัวเรือน พบว่า ผู้ให้สัมภาษณ์ต้องการให้สนับสนุนด้านการศึกษา เช่น ทุนการศึกษา พัฒนาโรงเรียน มอบอุปกรณ์การศึกษามากที่สุด ร้อยละ 19.5



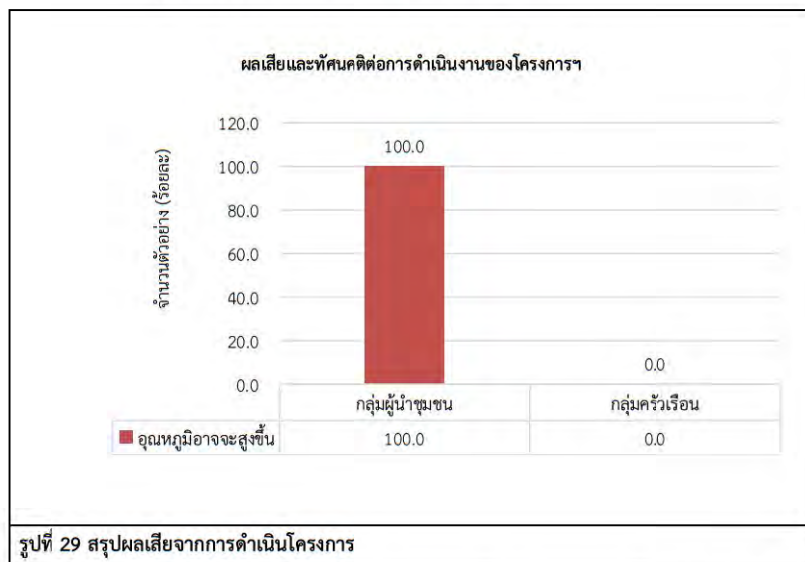
8.4 ผลลัพธ์ที่ชุมชนได้รับจากการดำเนินโครงการ มีรายละเอียดดังรูปที่ 28 โดยสามารถสรุปได้ดังนี้

- กลุ่มผู้นำชุมชน พบว่า ผู้ให้สัมภาษณ์ความเจริญและการพัฒนาที่ดีมาสู่ชุมชน มากที่สุด ร้อยละ 40.0
- กลุ่มครัวเรือน พบว่า ผู้ให้สัมภาษณ์ทำให้เกิดการจ้างงานในชุมชนมากขึ้น มากที่สุด ร้อยละ



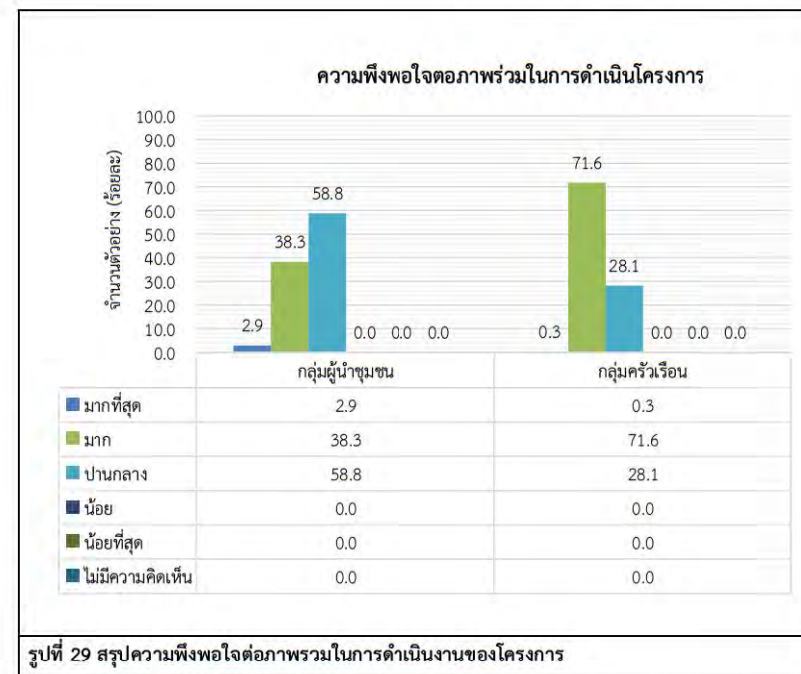
#### 8.5 ผลเสียจากการดำเนินโครงการ มีรายละเอียดดังรูปที่ 29 โดยสามารถสรุปได้ดังนี้

- กลุ่มผู้นำชุมชน พบว่า ผู้นำชุมชนทั้งหมดระบุว่า อุณหภูมิอาจจะสูงขึ้น
- กลุ่มครัวเรือน พบว่า ผู้ให้สัมภาษณ์ทั้งหมดไม่มีผลกระทบ



#### 8.6 ความพึงพอใจต่อภาพรวมในการดำเนินงานของโครงการ มีรายละเอียดดังรูปที่ 29 โดยสามารถสรุปได้ดังนี้

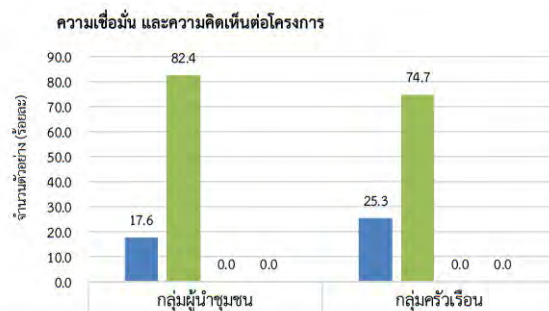
- กลุ่มผู้นำชุมชน พบว่า ผู้นำชุมชนมีความพึงพอใจในระดับปานกลาง มากที่สุด ร้อยละ 58.8 รองลงมามีความพึงพอใจระดับมาก ร้อยละ 38.3
- กลุ่มครัวเรือน พบว่า ผู้ให้สัมภาษณ์มีความพึงพอใจในระดับมาก มากที่สุด ร้อยละ 71.6 รองลงมามีความพึงพอใจระดับปานกลาง ร้อยละ 28.1



#### 8.7 ความเชื่อมั่นต่อระบบการจัดการด้านสิ่งแวดล้อมและมาตรการป้องกันผลกระทบด้านต่างๆ ของโครงการ มีรายละเอียดดังรูปที่ 30 โดยสามารถสรุปได้ดังนี้

- กลุ่มผู้นำชุมชน พบว่า ผู้นำชุมชนส่วนใหญ่ระบุว่า มีความเชื่อมั่นพอสมควร (หากมีอุบัติเหตุสามารถแก้ไขหรือควบคุมได้ทัน) มากที่สุด ร้อยละ 82.4 รองลงมาเชื่อมั่นสูง ร้อยละ 17.6
- กลุ่มครัวเรือน พบว่า ผู้ให้สัมภาษณ์ส่วนใหญ่มีความเชื่อมั่นพอสมควร (หากมีอุบัติเหตุสามารถแก้ไขหรือควบคุมได้ทัน) มากที่สุด ร้อยละ 74.7 รองลงมาเชื่อมั่นสูง ร้อยละ 25.3





รูปที่ 30 สรุปความพึงพอใจต่อความเชื่อมั่นของโครงการ

## ภาคผนวก ค.4

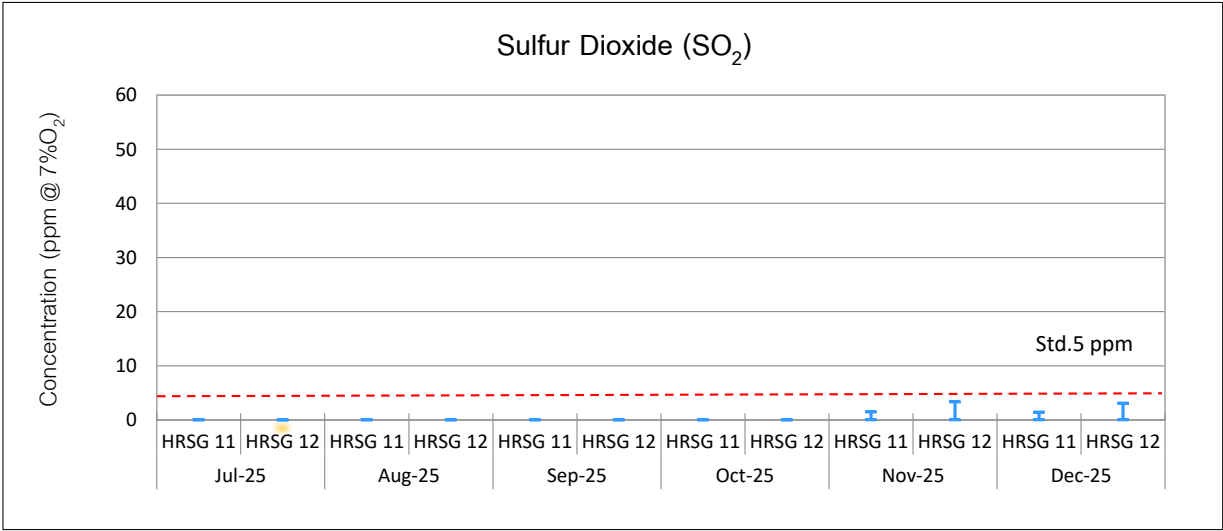
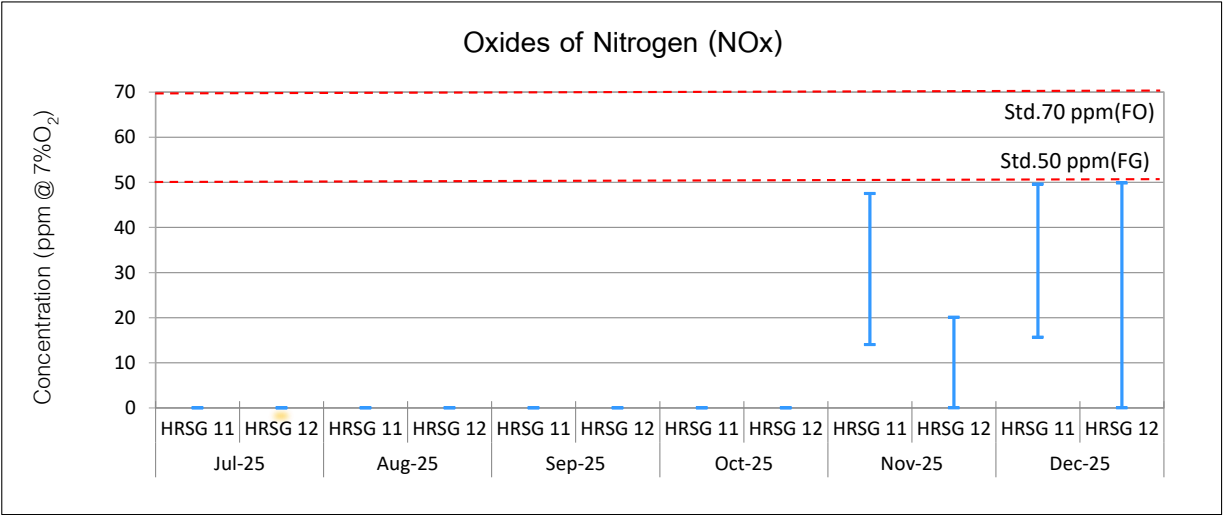
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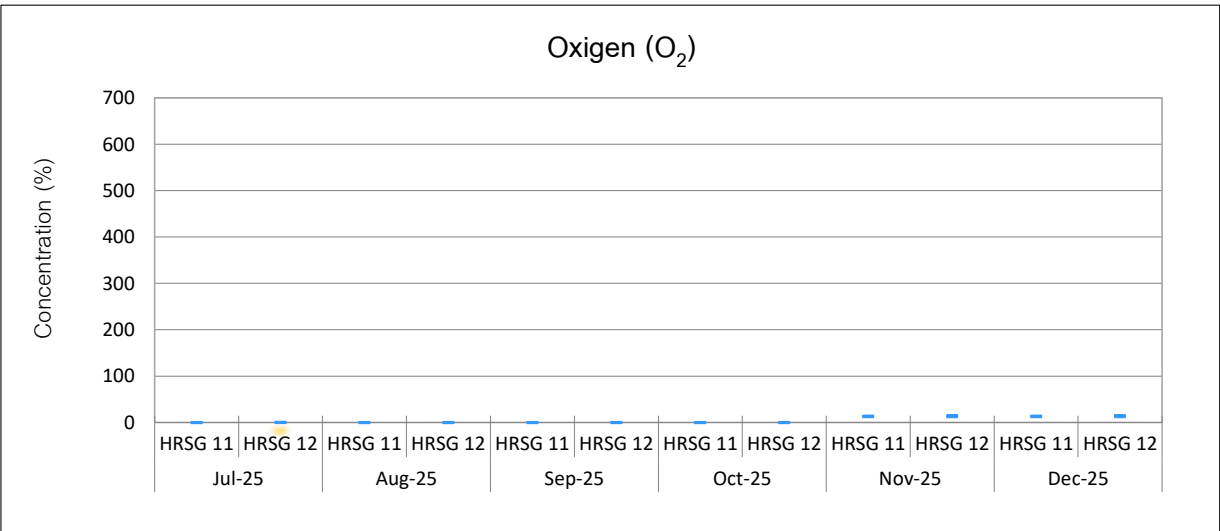
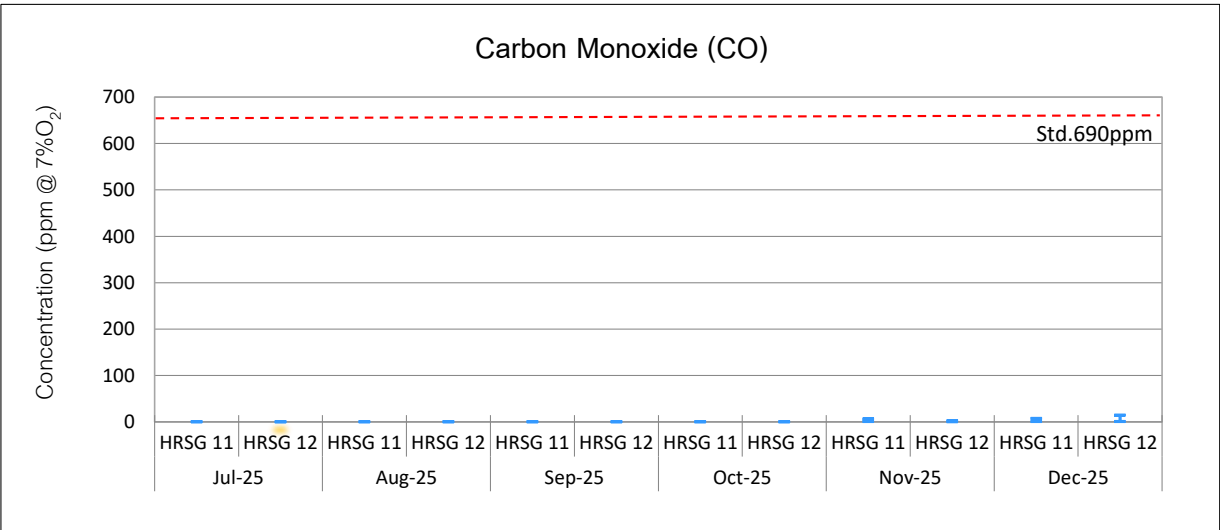
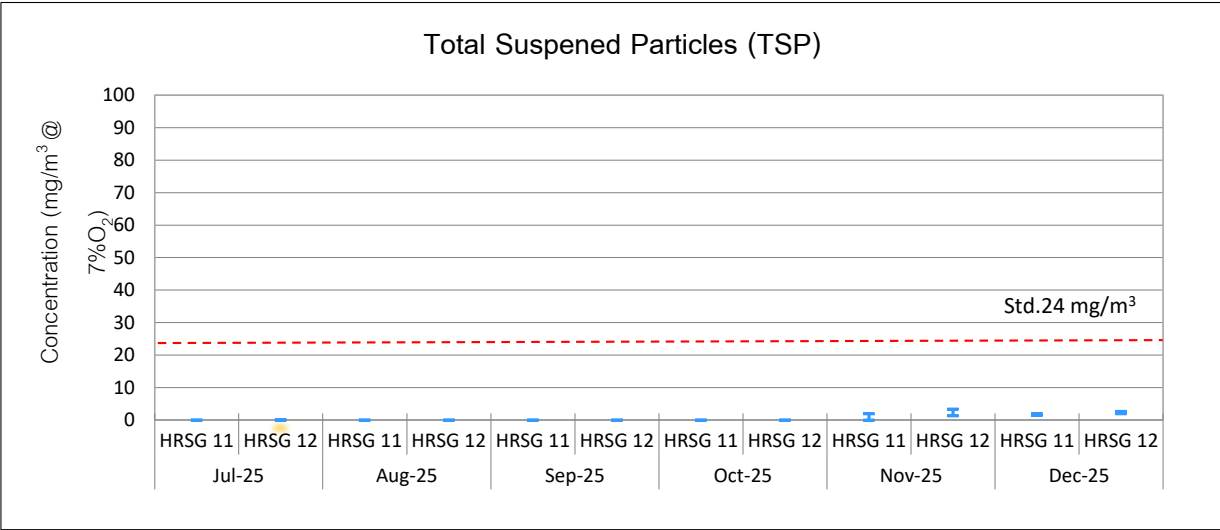
ข้อมูลระบบการตรวจวัดสารมลพิษแบบต่อเนื่อง (CEMs)

ระหว่างเดือนกรกฎาคม ถึงธันวาคม พ.ศ. 2568



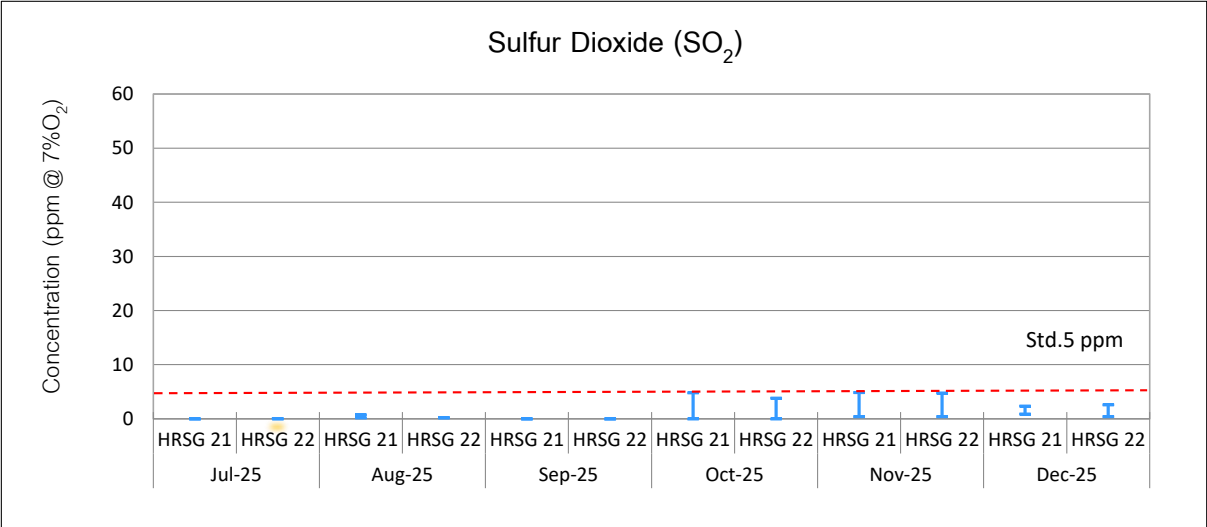
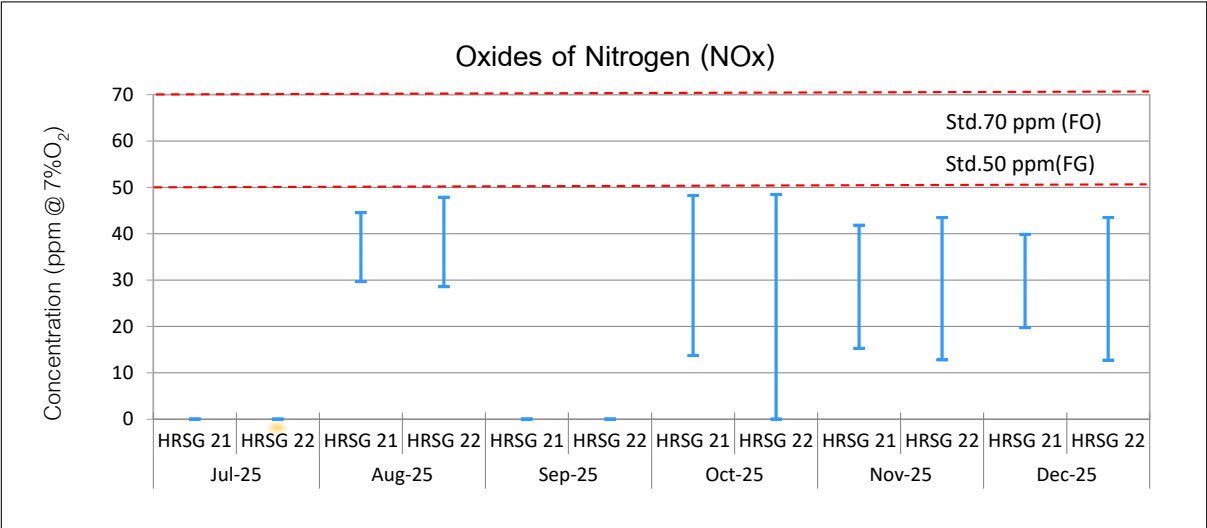
Block1		Jul-25		Aug-25		Sep-25		Oct-25		Nov-25		Dec-25	
		HRSG 11	HRSG 12	HRSG 11	HRSG 12	HRSG 11	HRSG 12	HRSG 11	HRSG 12	HRSG 11	HRSG 12	HRSG 11	HRSG 12
NO x	Min	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	14.01	0.00	15.68	0.00
	max	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	47.53	20.08	49.61	49.86
SO 2	Min	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	0.00	0.00	0.00	0.00
	max	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	1.45	3.30	1.45	3.08
TSP	Min	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	0.00	1.31	1.47	1.92
	max	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	1.94	3.33	1.98	2.64
CO	Min	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	0.60	0.12	0.66	0.66
	max	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	Shutdown	6.31	2.59	7.59	14.74

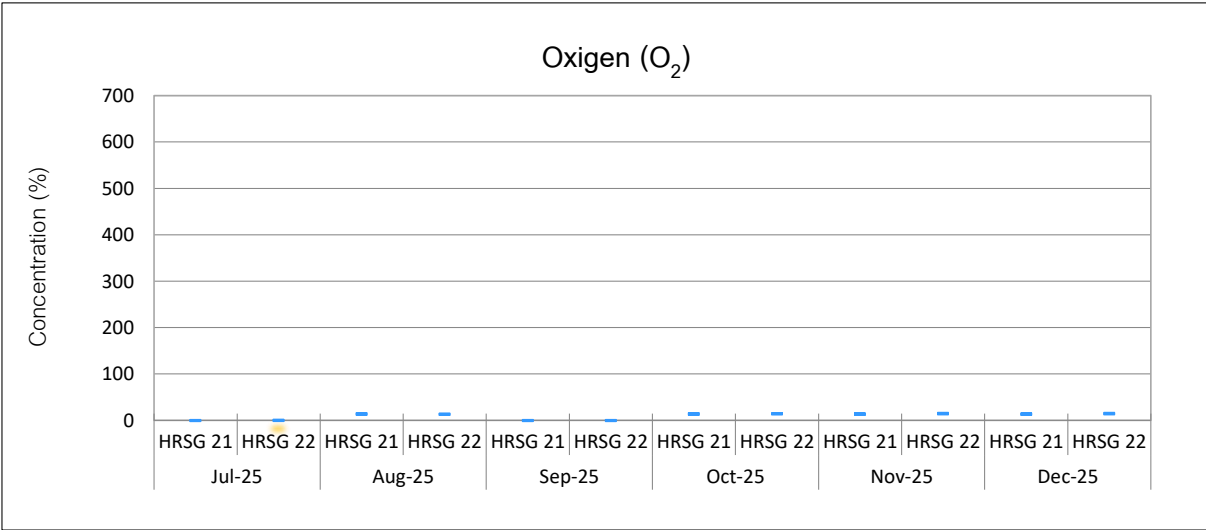
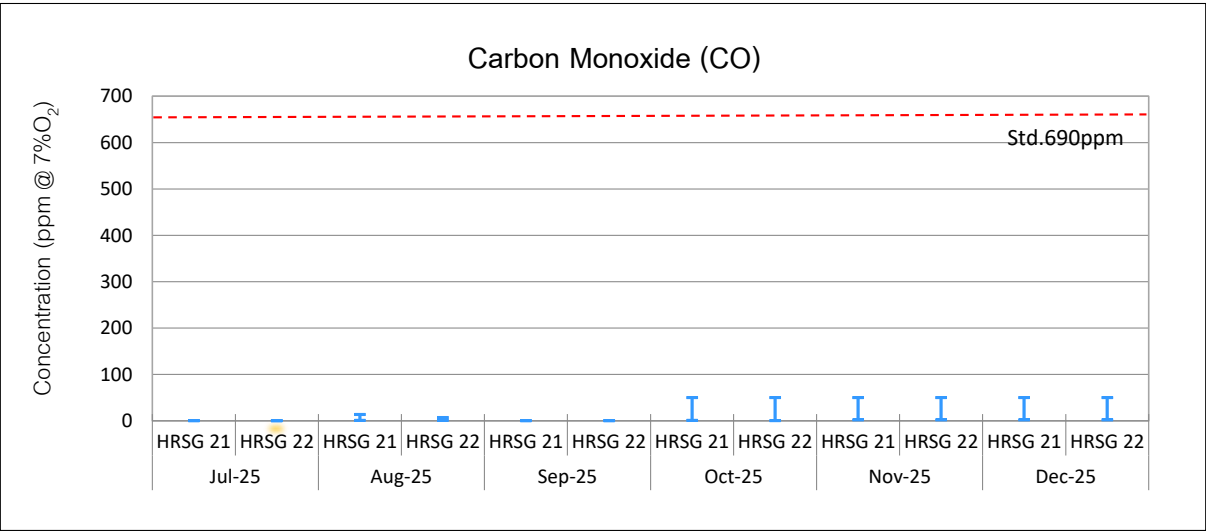
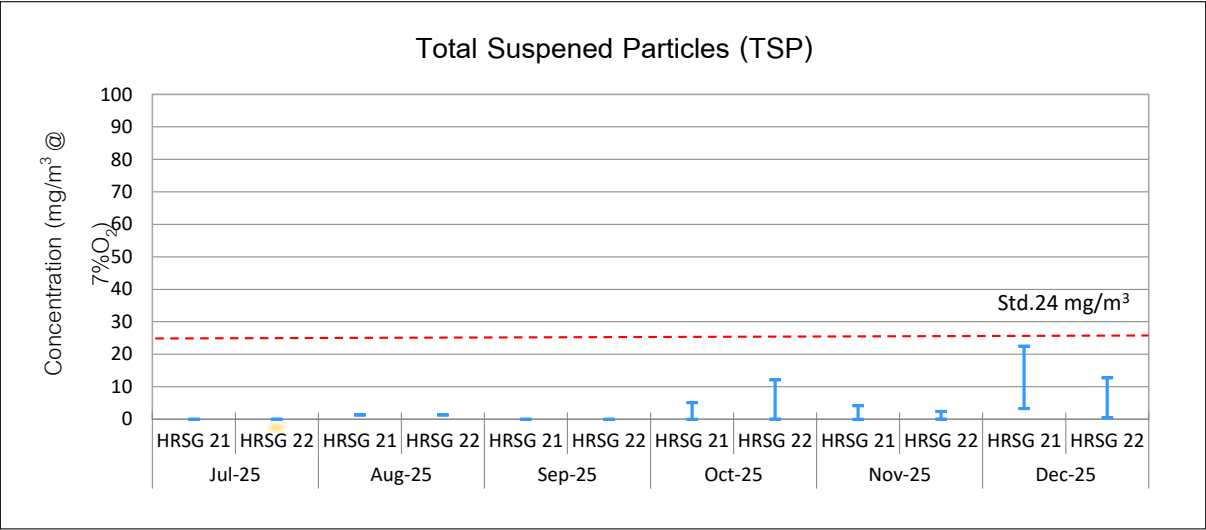






Block2		Jul-25		Aug-25		Sep-25		Oct-25		Nov-25		Dec-25	
		HRSG 21	HRSG 22	HRSG 21	HRSG 22	HRSG 21	HRSG 22	HRSG 21	HRSG 22	HRSG 21	HRSG 22	HRSG 21	HRSG 22
NO x	Min	Shutdown	Shutdown	29.70	28.59	Shutdown	Shutdown	13.73	0.02	15.28	12.75	19.75	12.75
	max	Shutdown	Shutdown	44.40	47.83	Shutdown	Shutdown	48.20	48.44	41.83	43.50	39.84	43.50
SO 2	Min	Shutdown	Shutdown	0.20	0.20	Shutdown	Shutdown	0.00	0.01	0.43	0.42	0.88	0.42
	max	Shutdown	Shutdown	0.76	0.21	Shutdown	Shutdown	4.80	3.81	4.87	4.77	2.38	2.60
TSP	Min	Shutdown	Shutdown	1.33	1.33	Shutdown	Shutdown	0.03	0.09	0.03	0.11	3.28	0.49
	max	Shutdown	Shutdown	1.33	1.33	Shutdown	Shutdown	5.16	12.15	4.18	2.42	22.52	12.77
CO	Min	Shutdown	Shutdown	0.94	0.59	Shutdown	Shutdown	0.73	0.04	1.59	1.71	1.59	1.75
	max	Shutdown	Shutdown	13.31	6.85	Shutdown	Shutdown	50.11	50.09	50.11	50.09	50.11	50.03







# ภาคผนวก ง

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ข้อมูลการสอบเทียบเครื่องมือ (Calibration Data Sheets)



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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Stack (CEMs)	Carbon Monoxide	Analyzer , System calibration, Star	-	-	-	-
Stack (CEMs)	Oxides of Nitrogen	Analyzer , System calibration, Star	-	-	-	-
Stack (CEMs)	Sulfur Dioxide	Analyzer , System calibration, Star	-	-	-	-
Stack (CEMs)	Oxygen	Analyzer , System calibration, Star	-	-	-	-
Stack	Total Suspended Particulate	Console Control Unit	BKK_FS0507	3-Jan-23	3-Jul-23	6
Stack	Total Suspended Particulate	Digital Balance	BKK_EN0002	8-Feb-23	8-Feb-24	12
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS1062	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS1063	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS1487	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0389	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS1486	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	High Volume	BKK_FS0358	-	-	On site Calibration
Ambient	Particulate Matter (PM-10)	Digital Balance	BKK_EN0403	30-May-25	30-May-26	12
Ambient	Total Suspended Particulate	High Volume	BKK_FS1058	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS1059	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS1485	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0373	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS1484	-	-	On site Calibration
Ambient	Total Suspended Particulate	High Volume	BKK_FS0374	-	-	On site Calibration
Ambient	Total Suspended Particulate	Digital Balance	BKK_EN0403	30-May-25	30-May-26	12
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS1072	2-Jul-25	2-Jan-26	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS1090	3-Jul-25	3-Jan-26	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS0785	2-Jul-25	2-Jan-26	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS1070	2-Jul-25	2-Jan-26	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS0800	2-Jul-25	2-Jan-26	6
Ambient	Nitrogen Dioxide	NO <sub>2</sub> Analyzer	BKK_FS0789	2-Jul-25	2-Jan-26	6
Ambient	Sulfur Dioxide	SO <sub>2</sub> Analyzer	BKK_FS1071	1-Jul-25	1-Jan-26	6
Ambient	Sulfur Dioxide	SO <sub>2</sub> Analyzer	BKK_FS1089	2-Jul-25	2-Jan-26	6
Ambient	Sulfur Dioxide	SO <sub>2</sub> Analyzer	BKK_FS0784	1-Jul-25	1-Jan-26	6
Ambient	Sulfur Dioxide	SO <sub>2</sub> Analyzer	BKK_FS1069	1-Jul-25	1-Jan-26	6
Ambient	Sulfur Dioxide	SO <sub>2</sub> Analyzer	BKK_FS0799	1-Jul-25	1-Jan-26	6
Ambient	Sulfur Dioxide	SO <sub>2</sub> Analyzer	BKK_FS0788	1-Jul-25	1-Jan-26	6
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0909	28-Jun-24	28-Dec-25	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0888	1-Aug-25	1-Feb-27	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0167	28-Jun-24	28-Dec-25	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS0910	10-Jun-24	10-Dec-25	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS1213	21-May-24	21-Nov-25	18
Ambient	Wind Speed / Wind Direction	Wind Speed / Wind Direction	BKK_FS1372	18-Dec-24	18-Jun-26	18
Noise	Leq 24 hrs	Sound Calibrator	BKK_FS0630	16-Jul-25	15-Jul-26	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0968	28-Apr-25	28-Apr-26	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0930	28-Apr-25	28-Apr-26	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0994	12-Nov-24	12-Nov-25	12
Noise	Leq 24 hrs	Sound Level Meter	BKK_FS0995	12-Nov-24	12-Nov-25	12
Noise	Leq 8 hrs	Sound Calibrator	BKK_FS0617	22-Oct-24	22-Oct-25	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0022	17-Jun-25	17-Jun-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0023	21-Jul-25	20-Jul-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0024	17-Jun-25	17-Jun-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0096	27-Jan-25	27-Jan-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0100	30-Aug-24	30-Aug-25	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0101	17-Jun-25	17-Jun-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0108	27-Jan-25	27-Jan-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0930	28-Apr-25	28-Apr-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0969	28-Apr-25	28-Apr-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0994	12-Nov-24	12-Nov-25	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0995	12-Nov-24	12-Nov-25	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0996	23-Aug-24	23-Aug-25	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0997	21-Jan-25	21-Jan-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0999	14-Nov-24	14-Nov-25	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS1000	14-Nov-24	14-Nov-25	12





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รายการเครื่องมือที่ใช้ในการวิเคราะห์ / ทดสอบ

Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS1214	14-Nov-24	14-Nov-25	12
Noise	Leq 8 hrs	Sound Calibrator	BKK_FS0632	16-Jan-25	16-Jan-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0028	24-Apr-25	24-Apr-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0030	27-Jan-25	27-Jan-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0031	21-Jul-25	20-Jul-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0097	27-Jan-25	27-Jan-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0099	4-Sep-25	3-Sep-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0100	4-Sep-25	3-Sep-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0107	2-Oct-25	1-Oct-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0113	27-Jan-25	27-Jan-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0115	27-Jan-25	27-Jan-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0116	27-Jan-25	27-Jan-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0117	13-Dec-24	13-Dec-25	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0875	21-Jan-25	21-Jan-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0876	9-Jan-25	9-Jan-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0927	21-Jan-25	21-Jan-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0929	19-Mar-25	19-Mar-26	12
Noise	Leq 8 hrs	Sound Calibrator	BKK_FS0630	16-Jul-25	15-Jul-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0107	2-Oct-25	1-Oct-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0109	27-Jan-25	27-Jan-26	12
Noise	Leq 8 hrs	Sound Level Meter	BKK_FS0110	13-Dec-24	13-Dec-25	12
Noise	Noise Contour	Sound Calibrator	BKK_FS0630	16-Jul-25	15-Jul-26	12
Noise	Noise Contour	Sound Level Meter	BKK_FS1001	14-Nov-24	14-Nov-25	12
Noise	Noise Contour	Sound Level Meter	BKK_FS0108	27-Jan-25	27-Jan-26	12
Noise	Noise Contour	Sound Level Meter	BKK_FS0111	21-Jan-25	21-Jan-26	12
Noise	Noise Contour	Sound Level Meter	BKK_FS1226	23-Dec-24	23-Dec-25	12
Workplace	Ammonia	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Ammonia	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Workplace	Ammonia	Spectrophotometer	BKK_EN0356	8-Oct-25	8-Oct-26	12
Workplace	Iron (III) chloride	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Iron (III) chloride	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Workplace	Iron (III) chloride	ICP-OES	BKK_EL0037	23-Sep-24	23-Mar-26	18
Workplace	Trisodium phosphate (Na <sub>3</sub> PO <sub>4</sub> )	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Trisodium phosphate (Na <sub>3</sub> PO <sub>4</sub> )	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Workplace	Trisodium phosphate (Na <sub>3</sub> PO <sub>4</sub> )	ICP-OES	BKK_EL0037	23-Sep-24	23-Mar-26	18
Workplace	Sodium bisulfite	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Sodium bisulfite	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Workplace	Sodium bisulfite	ICP-OES	BKK_EL0037	23-Sep-24	23-Mar-26	18
Workplace	Sulfuric Acid	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Sulfuric Acid	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Workplace	Sulfuric Acid	Ion Chromatography	BKK_EN0427	21-Nov-24	21-Nov-25	12
Workplace	Sodium hydroxide as NaOH	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Sodium hydroxide as NaOH	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Workplace	Chlorine	DRYCAL FLOWMETER	BKK_FS0614	10-Sep-25	9-Sep-26	12
Workplace	Chlorine	DRYCAL FLOWMETER	BKK_FS0619	10-Sep-25	9-Sep-26	12
Heat	Heat Stress	Heat Stress Monitor	BKK_FS0677	7-Jul-25	7-Jul-26	12
Heat	Heat Stress	Heat Stress Monitor	BKK_FS0680	6-Jun-25	6-Jun-26	12
Heat	Heat Stress	Heat Stress Monitor	BKK_FS0670	24-Jul-25	23-Jul-26	12
Heat	Heat Stress	Heat Stress Monitor	BKK_FS0669	24-Jul-25	23-Jul-26	12
Heat	Heat Stress	Heat Stress Monitor	BKK_FS0672	10-Feb-25	10-Feb-26	12
Heat	Heat Stress	Heat Stress Monitor	BKK_FS0678	10-Feb-25	10-Feb-26	12
Illuminance	Illuminance	Lux Meter	BKK_FS1145	18-Sep-25	17-Sep-26	12
Noise	Noise Dose, TWA	Dose Badge Reader	BKK_FS1002	2-Dec-24	2-Dec-25	12
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0044	3-Oct-24	3-Oct-25	12
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0045	3-Oct-24	3-Oct-25	12
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0046	3-Oct-24	3-Oct-25	12
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0047	3-Oct-24	3-Oct-25	12
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0057	27-Jun-25	27-Jun-26	12
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0062	27-Jun-25	27-Jun-26	12



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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0072	23-Sep-24	23-Sep-25	12
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0078	27-Sep-24	27-Sep-25	12
Noise	Noise Dose, TWA	Dose Badge Reader	BKK_FS0628	29-Aug-25	28-Aug-26	12
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0038	3-Sep-25	2-Sep-26	12
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0039	3-Sep-25	2-Sep-26	12
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0042	17-Sep-25	16-Sep-26	12
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0046	30-Sep-25	29-Sep-26	12
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0072	19-Sep-25	18-Sep-26	12
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0074	19-Sep-25	18-Sep-26	12
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0075	31-Jul-25	30-Jul-26	12
Noise	Noise Dose, TWA	Dosimeter	BKK_FS0083	19-Sep-25	18-Sep-26	12
Water Lab	Arsenic	ICP-MS	BKK_EL0043	3-Oct-25	2-Oct-26	12
Water Lab	Arsenic	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Arsenic	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Barium	ICP-MS	BKK_EL0043	3-Oct-25	2-Oct-26	12
Water Lab	Barium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Barium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Chromium	ICP-MS	BKK_EL0043	3-Oct-25	2-Oct-26	12
Water Lab	Chromium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Chromium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Cadmium	ICP-MS	BKK_EL0043	3-Oct-25	2-Oct-26	12
Water Lab	Cadmium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Cadmium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Copper	ICP-MS	BKK_EL0043	3-Oct-25	2-Oct-26	12
Water Lab	Copper	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Copper	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Lead	ICP-MS	BKK_EL0043	3-Oct-25	2-Oct-26	12
Water Lab	Lead	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Lead	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Iron	ICP-MS	BKK_EL0043	3-Oct-25	2-Oct-26	12
Water Lab	Iron	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Iron	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Nickel	ICP-MS	BKK_EL0043	3-Oct-25	2-Oct-26	12
Water Lab	Nickel	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Nickel	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Manganese	ICP-MS	BKK_EL0043	3-Oct-25	2-Oct-26	12
Water Lab	Manganese	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Manganese	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Selenium	ICP-MS	BKK_EL0043	3-Oct-25	2-Oct-26	12
Water Lab	Selenium	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Selenium	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18





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Sample Name	Parameter	Equipment Name	ID No.	Calibrated Date	Next Cal	Freq. Calibrate (Months)
Water Lab	Zinc	ICP-MS	BKK_EL0043	3-Oct-25	2-Oct-26	12
Water Lab	Zinc	Hot Block	BKK_EL0054	4-Mar-25	4-Sep-26	18
Water Lab	Zinc	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Mercury	DUO-CVAFS / CVAAS	BKK_EL0023	12-Dec-24	12-Jun-26	18
Water Lab	Temperature	pH Meter with Sensor	BKK_LG0031	17-Feb-25	17-Feb-26	12
Water Lab	BOD	DO Meter	BKK_EN0205	25-Jul-25	25-Jan-27	18
Water Lab	BOD	Incubator	BKK_EN0304	4-Mar-25	4-Mar-26	12
Water Lab	BOD	Burette	BKK_EN0422	3-Sep-25	3-Sep-26	12
Water Lab	COD	Hot Block	BKK_EN0222	9-Apr-25	9-Apr-26	12
Water Lab	COD	Spectrophotometer	BKK_EN0356	8-Oct-25	8-Oct-26	12
Water Lab	Total Suspended Solids	Electronic Top-Loading Balance	BKK_EN0003	17-Jul-25	17-Jul-26	12
Water Lab	Total Suspended Solids	Oven	BKK_EN0425	6-Oct-25	6-Oct-26	12
Water Lab	Total Dissolved Solids 180°C	Electronic Top-Loading Balance	BKK_EN0003	17-Jul-25	17-Jul-26	12
Water Lab	Total Dissolved Solids 180°C	Oven	BKK_EN0425	6-Oct-25	6-Oct-26	12
Water Lab	Oil & Grease	Electronic Top-Loading Balance	BKK_EN0003	17-Jul-25	17-Jul-26	12
Water Lab	Oil & Grease	Water Bath	BKK_EN0439	9-Oct-25	9-Oct-26	12
Water Lab	pH at 25 °C	pH meter	BKK_EN0342	9-Oct-25	9-Oct-26	12
Water Lab	Residual Free Chlorine	Chlorine Meter	BKK_LG0042	19-Feb-25	19-Feb-26	12
Water Lab	Organochlorine Pesticide	GC MSMS	BKK_EN0284	21-Nov-24	21-May-26	18
Water Lab	Volatile Organic Compound	Gas Chromatography (MSD)	BKK_EN0059	25-Jun-25	25-Dec-26	18
Water Lab	Cyanide	Spectrophotometer	BKK_EN0356	8-Oct-25	8-Oct-26	12
Water Lab	Cyanide	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	PCBs	GC MSMS	BKK_EN0284	21-Nov-24	21-May-26	18
Water Lab	Benzo(a)pyrene	Gas Chromatography (MSD)	BKK_EN0049	25-Oct-24	25-Apr-26	18
Water Lab	Vinyl chloride	Gas Chromatography (MSD)	BKK_EN0059	25-Jun-25	25-Dec-26	18
Water Lab	Ammonia Nitrogen	Discrete analyzer	BKK_EN0438	3-Sep-25	3-Sep-26	12
Water Lab	Total Hardness	Burette	BKK_EN0296	29-Nov-24	29-May-26	18
Water Lab	Color	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Turbidity	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Sulfide	Burette	BKK_EN0422	3-Sep-25	3-Sep-26	12
Water Lab	Sulfide	Chamber (Cooling Room)	BKK_EN0167	4-Jun-25	4-Dec-26	18
Water Lab	Nitrate nitrogen	Ion Chromatography	BKK_EN0427	21-Nov-24	21-Nov-25	12
Water Lab	Chloride	Ion Chromatography	BKK_EN0427	21-Nov-24	21-Nov-25	12
Water Lab	Sulfate	Ion Chromatography	BKK_EN0427	21-Nov-24	21-Nov-25	12
Water Lab	Conductivity	Conductivity meter	BKK_EN0373	30-Jun-25	30-Jun-26	12
Water Lab	Pyrethroid Group Pesticides	GC MSMS	BKK_EN0284	21-Nov-24	21-May-26	18

ANALYZER CALIBRATION DATA

Client: Gulf Power Generation Co., Ltd. Location: HRSG 21

Date: 04 Apr 23 Test Operator: Usman N.

NO<sub>x</sub> ANALYZER Model: TELETYPE API 200EH Serial No.: 549

Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.00
Low-Level Gas	0.00	0.00	0.00
Span Gas	18.00	18.00	0.00

NO<sub>2</sub> ANALYZER Model: TELETYPE API 200EH Serial No.: 549

Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.00
Low-Level Gas	0.00	0.00	0.00
Span Gas	18.00	18.00	0.00

SO<sub>2</sub> ANALYZER Model: TELETYPE API 100EH Serial No.: 202

Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.00
Low-Level Gas	0.00	0.00	0.00
Span Gas	18.00	18.00	0.00

CO ANALYZER Model: TELETYPE API 300EM Serial No.: 300

Cylinder Value (ppm)	Initial Analyzers Calibration Response (ppm)	Final Analyzers Calibration Response (ppm)	Difference (Percent of Span)
Zero Gas	0.00	0.00	0.00
Low-Level Gas	0.00	0.00	0.00
Span Gas	18.00	18.00	0.00

Calibrated by: *Usman N.*

(Mr. Usman N.)  
Environmental Field Scientist (4)

FORM NO. F-06-104 REVISION NO. 2 ISSUE DATE: 09/01/18  
ALS Laboratory Group

SYSTEM CALIBRATION BIAS AND DRIFT DATA

Client: Gulf Power Generation Co., Ltd. Location: HRSG 21

Date: 04 Apr 23 Test Operator: Usman N.

NO<sub>x</sub> ANALYZER Cylinder Conc. (ppm): 16.08 Span (ppm): 20.00

NO <sub>x</sub> Analyzer Calibration Response	System Calibration Response	System Calibration Response	System Calibration Response	System Calibration Response	Drift (% of Span)
Zero Gas	0.00	0.00	0.00	0.00	0.00
Low-Level Gas	0.00	0.00	0.00	0.00	0.00
Span Gas	16.08	16.11	0.12	16.11	0.12

NO<sub>2</sub> ANALYZER Cylinder Conc. (ppm): 188.30 Span (ppm): 200

NO <sub>2</sub> Analyzer Calibration Response	System Calibration Response	System Calibration Response	System Calibration Response	System Calibration Response	Drift (% of Span)
Zero Gas	0.04	0.05	0.01	0.05	0.01
Low-Level Gas	187.78	187.30	-0.24	186.73	-0.25

SO<sub>2</sub> ANALYZER Cylinder Conc. (ppm): 181.80 Span (ppm): 200

SO <sub>2</sub> Analyzer Calibration Response	System Calibration Response	System Calibration Response	System Calibration Response	System Calibration Response	Drift (% of Span)
Zero Gas	0.00	0.00	0.00	0.00	0.00
Low-Level Gas	180.73	180.69	-1.02	180.33	-1.20

CO ANALYZER Cylinder Conc. (ppm): 157.50 Span (ppm): 200

CO Analyzer Calibration Response	System Calibration Response	System Calibration Response	System Calibration Response	System Calibration Response	Drift (% of Span)
Zero Gas	0.03	0.03	0.00	0.04	0.01
Low-Level Gas	157.07	156.58	-0.24	156.42	-0.33

Calibrated by: *Usman N.*

(Mr. Usman N.)  
Environmental Field Scientist (4)

FORM NO. F-06-104 REVISION NO. 2 ISSUE DATE: 09/01/18  
ALS Laboratory Group

CEMS Data

Client Name: Gulf Power Generation Co., Ltd. Date: April 4, 2023

Plant Name: HRSG Location: 200231

Run No.	Time	NO <sub>x</sub>	NO <sub>2</sub>	SO <sub>2</sub>	CO	Run No.	Time	NO <sub>x</sub>	NO <sub>2</sub>	SO <sub>2</sub>	CO
1	00:00	16.08	188.30	181.80	157.50	1	00:00	16.08	188.30	181.80	157.50
2	00:05	16.08	188.30	181.80	157.50	2	00:05	16.08	188.30	181.80	157.50
3	00:10	16.08	188.30	181.80	157.50	3	00:10	16.08	188.30	181.80	157.50
4	00:15	16.08	188.30	181.80	157.50	4	00:15	16.08	188.30	181.80	157.50
5	00:20	16.08	188.30	181.80	157.50	5	00:20	16.08	188.30	181.80	157.50
6	00:25	16.08	188.30	181.80	157.50	6	00:25	16.08	188.30	181.80	157.50
7	00:30	16.08	188.30	181.80	157.50	7	00:30	16.08	188.30	181.80	157.50
8	00:35	16.08	188.30	181.80	157.50	8	00:35	16.08	188.30	181.80	157.50
9	00:40	16.08	188.30	181.80	157.50	9	00:40	16.08	188.30	181.80	157.50
10	00:45	16.08	188.30	181.80	157.50	10	00:45	16.08	188.30	181.80	157.50
11	00:50	16.08	188.30	181.80	157.50	11	00:50	16.08	188.30	181.80	157.50
12	00:55	16.08	188.30	181.80	157.50	12	00:55	16.08	188.30	181.80	157.50
13	01:00	16.08	188.30	181.80	157.50	13	01:00	16.08	188.30	181.80	157.50
14	01:05	16.08	188.30	181.80	157.50	14	01:05	16.08	188.30	181.80	157.50
15	01:10	16.08	188.30	181.80	157.50	15	01:10	16.08	188.30	181.80	157.50
16	01:15	16.08	188.30	181.80	157.50	16	01:15	16.08	188.30	181.80	157.50
17	01:20	16.08	188.30	181.80	157.50	17	01:20	16.08	188.30	181.80	157.50
18	01:25	16.08	188.30	181.80	157.50	18	01:25	16.08	188.30	181.80	157.50
19	01:30	16.08	188.30	181.80	157.50	19	01:30	16.08	188.30	181.80	157.50
20	01:35	16.08	188.30	181.80	157.50	20	01:35	16.08	188.30	181.80	157.50
21	01:40	16.08	188.30	181.80	157.50	21	01:40	16.08	188.30	181.80	157.50
22	01:45	16.08	188.30	181.80	157.50	22	01:45	16.08	188.30	181.80	157.50
23	01:50	16.08	188.30	181.80	157.50	23	01:50	16.08	188.30	181.80	157.50
24	01:55	16.08	188.30	181.80	157.50	24	01:55	16.08	188.30	181.80	157.50
25	02:00	16.08	188.30	181.80	157.50	25	02:00	16.08	188.30	181.80	157.50
26	02:05	16.08	188.30	181.80	157.50	26	02:05	16.08	188.30	181.80	157.50
27	02:10	16.08	188.30	181.80	157.50	27	02:10	16.08	188.30	181.80	157.50
28	02:15	16.08	188.30	181.80	157.50	28	02:15	16.08	188.30	181.80	157.50
29	02:20	16.08	188.30	181.80	157.50	29	02:20	16.08	188.30	181.80	157.50
30	02:25	16.08	188.30	181.80	157.50	30	02:25	16.08	188.30	181.80	157.50
31	02:30	16.08	188.30	181.80	157.50	31	02:30	16.08	188.30	181.80	157.50
32	02:35	16.08	188.30	181.80	157.50	32	02:35	16.08	188.30	181.80	157.50
33	02:40	16.08	188.30	181.80	157.50	33	02:40	16.08	188.30	181.80	157.50
34	02:45	16.08	188.30	181.80	157.50	34	02:45	16.08	188.30	181.80	157.50
35	02:50	16.08	188.30	181.80	157.50	35	02:50	16.08	188.30	181.80	157.50
36	02:55	16.08	188.30	181.80	157.50	36	02:55	16.08	188.30	181.80	157.50
37	03:00	16.08	188.30	181.80	157.50	37	03:00	16.08	188.30	181.80	157.50
38	03:05	16.08	188.30	181.80	157.50	38	03:05	16.08	188.30	181.80	157.50
39	03:10	16.08	188.30	181.80	157.50	39	03:10	16.08	188.30	181.80	157.50
40	03:15	16.08	188.30	181.80	157.50	40	03:15	16.08	188.30	181.80	157.50
41	03:20	16.08	188.30	181.80	157.50	41	03:20	16.08	188.30	181.80	157.50
42	03:25	16.08	188.30	181.80	157.50	42	03:25	16.08	188.30	181.80	157.50
43	03:30	16.08	188.30	181.80	157.50	43	03:30	16.08	188.30	181.80	157.50
44	03:35	16.08	188.30	181.80	157.50	44	03:35	16.08	188.30	181.80	157.50
45	03:40	16.08	188.30	181.80	157.50	45	03:40	16.08	188.30	181.80	157.50
46	03:45	16.08	188.30	181.80	157.50	46	03:45	16.08	188.30	181.80	157.50
47	03:50	16.08	188.30	181.80	157.50	47	03:50	16.08	188.30	181.80	157.50
48	03:55	16.08	188.30	181.80	157.50	48	03:55	16.08	188.30	181.80	157.50
49	04:00	16.08	188.30	181.80	157.50	49	04:00	16.08	188.30	181.80	157.50
50	04:05	16.08	188.30	181.80	157.50	50	04:05	16.08	188.30	181.80	157.50
51	04:10	16.08	188.30	181.80	157.50	51	04:10	16.08	188.30	181.80	157.50
52	04:15	16.08	188.30	181.80	157.50	52	04:15	16.08	188.30	181.80	157.50
53	04:20	16.08	188.30	181.80	157.50	53	04:20	16.08	188.30	181.80	157.50
54	04:25	16.08	188.30	181.80	157.50	54	04:25	16.08	188.30	181.80	157.50
55	04:30	16.08	188.30	181.80	157.50	55	04:30	16.08	188.30	181.80	157.50
56	04:35	16.08	188.30	181.80	157.50	56	04:35	16.08	188.30	181.80	157.50
57	04:40	16.08	188.30	181.80	157.50	57	04:40	16.08	188.30	181.80	157.50
58	04:45	16.08	188.30	181.80	157.50	58	04:45	16.08	188.30	181.80	157.50
59	04:50	16.08	188.30	181.80	157.50	59	04:50	16.08	188.30	181.80	157.50
60	04:55	16.08	188.30	181.80	157.50	60	04:55	16.08	188.30	181.80	157.50
61	05:00	16.08	188.30	181.80	157.50	61	05:00	16.08	188.30	181.80	157.50
62	05:05	16.08	188.30	181.80	157.50	62	05:05	16.08	188.30	181.80	157.50
63	05:10	16.08	188.30	181.80	157.50	63	05:10	16.08	188.30	181.80	157.50
64	05:15	16.08	188.30	181.80	157.50	64	05:15	16.08	188.30	181.80	157.50
65	05:20	16.08	188.30	181.80	157.50	65	05:20	16.08	188.30	181.80	157.50
66	05:25	16.08	188.30	181.80	157.50	66	05:25	16.08	188.30	181.80	157.50
67	05:30	16.08	188.30	181.80	157.50	67	05:30	16.08	188.30	181.80	157.50
68	05:35	16.08	188.30	181.80	157.50	68	05:35	16.08	188.30	181.80	157.50
69	05:40	16.08	188.30	181.80	157.50	69	05:40	16.08	188.30	181.80	157.50
70	05:45	16.08	188.30	181.80	157.50	70	05:45	16.08	188.30	181.80	157.50
71	05:50	16.08	188.30	181.80	157.50	71	05:50	16.08	188.30	181.80	157.50
72	05:55	16.08	188.30	181.80	157.50	72	05:55	16.08	188.30	181.80	157.50
73	06:00	16.08	188.30	181.80	157.50	73	06:00	16.08	188.30	181.80	157.50
74	06:05	16.08	188.30	181.80	157.50	74	06:05	16.08	188.30	181.80	157.50
75	06:10	16.08	188.30	181.80	157.50	75	06:10	16.08	188.30	181.80	157.50
76	06:15	16.08	188.30	181.80	157.50	76	06:15	16.08	188.30	181.80	157.50
77	06:20	16.08	188.30	181.80	157.50	77	06:20	16.08	188.30	181.80	157.50
78	06:25	16.08	188.30	181.80	157.50	78	06:25	16.08	188.30	181.80	157.50
79	06:30	16.08	188.30	181.80	157.50	79	06:30	16.08	188.30	181.80	157.50
80	06:35	16.08	188.30	181.80	157.50	80	06:35	16.08	188.30	181.80	157.50
81	06:40	16.08	188.30	181.80	157.50	81	06:40	16.08	188.30	181.80	157.50
82	06:45										



## CERTIFICATE OF ANALYSIS

Customer (Name): <b>ALS Laboratory Group (Thailand)</b>	Production Order Number: <b>0014553</b>
Cylinder Description: <b>37800-CL</b>	Material Number: <b>479100-344</b>
	Certificate Date: <b>07-Dec-2023</b>
	Expiry Date: <b>07-Dec-2025</b>
Certificate Number: <b>398317</b>	Analysis: <b>Arising T.</b>
Cylinder Number: <b>40233</b>	ARISARA THONGNARE
Normal Cylinder Content: <b>6.828 MPa</b>	Approved: <b>SURANYA KAMUTHARAT</b>
Normal Pressure: <b>145.8 Bar</b>	
Valve Outlet: <b>CGA 590 BRASS</b>	To Be Order Price Quote: <b>479100-344</b>
Comments:	

It is recommended that this product be not used below 2% of actual contents or should not be used when its gas pressure is below 10% MPa.

Other impurities that detect by analytical condition of this mixture shall be report if it is more than 10% of maximum value component.

Keep and use in well-ventilated and secure area.

Page 1 of 2

ALS (Thailand) Public Company Limited

17/F, Bangkok Tower A, 225 Moo 1, Bangna-Phra Pradaeng Road, Bangna Suburb, Bangkok 10700, Thailand  
 Tel: 02-010-0000, Fax: 02-010-0001, Email: info@als.co.th, Website: www.als.co.th

Linde (Thailand) Public Company Limited

17/F, Bangkok Tower A, 225 Moo 1, Bangna-Phra Pradaeng Road, Bangna Suburb, Bangkok 10700, Thailand  
 Tel: 02-010-0000, Fax: 02-010-0001, Email: info@als.co.th, Website: www.als.co.th

## CERTIFICATE OF ANALYSIS

Component	Report Concentration	Certified Concentration	Cylinder Uncertainty	Standard	Unit
Oxygen	8.86 %	8.85 %	± 0.00005 %	100.0000 %	(+/- 0.00005 %)
In Nitrogen					

Reference Standard (Unit: %)		
Cylinder No.	Concentration	Uncertainty
111559G	9.86 ± 0.02 %	± 0.00005 %
Oxygen		
In Nitrogen		

Analytical Instruments and Software		
Instrument/Model	Software/Version	Calibration/Location
PerkinElmer 4000 Series	PerkinElmer	04-Dec-2023

Model of Analysis		
1. Gas Chromatography		
2. PerkinElmer Oxygen Analyzer		
3. PerkinElmer Oxygen Analyzer		
4. PerkinElmer Oxygen Analyzer		
5. PerkinElmer Oxygen Analyzer		
6. Other specified		

Cylinder Number: <b>40233</b>	Production Order Number: <b>0014553</b>
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Page 1 of 2

ALS (Thailand) Public Company Limited

17/F, Bangkok Tower A, 225 Moo 1, Bangna-Phra Pradaeng Road, Bangna Suburb, Bangkok 10700, Thailand  
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 Tel: 02-010-0000, Fax: 02-010-0001, Email: info@als.co.th, Website: www.als.co.th

CERTIFICATE OF ANALYSIS  
Grade of Product: EPA Protocol

Part Number: <b>602004E1500787</b>	Reference Number: <b>160-01948145-1</b>
Cylinder Number: <b>CC470033</b>	Cylinder Volume: <b>145.8 CF</b>
Laboratory: <b>1241 - Piquetteville, PA</b>	Cylinder Pressure: <b>2010 PSIG</b>
POPM Number: <b>A17020</b>	Valve Outlet: <b>590</b>
Gas Code: <b>O2,BALN</b>	Certification Date: <b>Nov 11, 2020</b>

Expiry Date: Nov 11, 2028

Certification performed in accordance with EPA Method 21/22 for Oxygen and Nitrogen. The analysis was performed using a calibrated gas analyzer. The analysis was performed in a clean, dry, and well-ventilated area. The analysis was performed by a trained and certified analyst. The analysis was performed using a calibrated gas analyzer. The analysis was performed in a clean, dry, and well-ventilated area. The analysis was performed by a trained and certified analyst.

Component	Reported Concentration	Actual Concentration	Uncertainty	Total Relative Uncertainty	Assay Date
Oxygen	15.00 %	15.00 %	± 0.0001 %	± 0.0001 %	11/11/2020
Nitrogen	85.00 %	85.00 %	± 0.0001 %	± 0.0001 %	11/11/2020

Calibration Standards		
Type	Lot ID	Cylinder No.
Oxygen	1000000	CC470033
Nitrogen	1000000	CC470033

ANALYTICAL EQUIPMENT		
Instrument/Model	Software/Version	Calibration/Location
PerkinElmer 4000 Series	PerkinElmer	04-Dec-2023

Tried Data Available Upon Request

NOTES:  
Group Weight: 77.5 kg  
Net Weight: 4.7 kg

Approved for Release

Page 1 of 10-0150145-1



## EMISSION TEST RESULT

Client: <b>Gulf Power Generation Co., Ltd.</b>	Run #: <b>2</b>
Date: <b>04 Apr 23</b>	Location: <b>Uthmaniyah</b>
Start Time: <b>10:11</b>	Test Operator: <b>Uthmaniyah</b>
End Time: <b>10:11</b>	Finish Time: <b>10:11</b>
CO <sub>2</sub> Analyzer Model: <b>TELETYPE API 3000M</b>	Serial No.: <b>280</b>
NO <sub>x</sub> Analyzer Model: <b>TELETYPE API 3000M</b>	Serial No.: <b>280</b>
CO <sub>2</sub> Analyzer Model: <b>TELETYPE API 3000M</b>	Serial No.: <b>300</b>

Time (min)	CO <sub>2</sub> (%)	CO <sub>2</sub> (ppm)	NO <sub>x</sub> (ppm)	CO (ppm)	Remark
10:11	12.54	4.59	21.40	0.34	0.07
10:12	12.54	4.59	21.40	0.34	0.07
10:13	12.54	4.59	21.40	0.34	0.07
10:14	12.54	4.59	21.40	0.34	0.07
10:15	12.54	4.59	21.40	0.34	0.07
10:16	12.54	4.59	21.40	0.34	0.07
10:17	12.54	4.59	21.40	0.34	0.07
10:18	12.54	4.59	21.40	0.34	0.07
10:19	12.54	4.59	21.40	0.34	0.07
10:20	12.54	4.59	21.40	0.34	0.07
10:21	12.54	4.59	21.40	0.34	0.07
10:22	12.54	4.59	21.40	0.34	0.07
10:23	12.54	4.59	21.40	0.34	0.07
10:24	12.54	4.59	21.40	0.34	0.07
10:25	12.54	4.59	21.40	0.34	0.07
10:26	12.54	4.59	21.40	0.34	0.07
10:27	12.54	4.59	21.40	0.34	0.07
10:28	12.54	4.59	21.40	0.34	0.07
10:29	12.54	4.59	21.40	0.34	0.07
10:30	12.54	4.59	21.40	0.34	0.07
Average	12.54	4.59	21.40	0.34	0.07

(Mr. Uthmaniyah)

Environmental Field Scientist (E)

FORM NO. F-0002 REVISION NO. 2 ISSUE DATE: 2019/01

ALS Laboratory Group



## EMISSION TEST RESULT

Client: <b>Gulf Power Generation Co., Ltd.</b>	Run #: <b>2</b>
Date: <b>04 Apr 23</b>	Location: <b>Uthmaniyah</b>
Start Time: <b>10:11</b>	Test Operator: <b>Uthmaniyah</b>
End Time: <b>10:11</b>	Finish Time: <b>10:11</b>
CO <sub>2</sub> Analyzer Model: <b>TELETYPE API 3000M</b>	Serial No.: <b>280</b>
NO <sub>x</sub> Analyzer Model: <b>TELETYPE API 3000M</b>	Serial No.: <b>280</b>
CO <sub>2</sub> Analyzer Model: <b>TELETYPE API 3000M</b>	Serial No.: <b>300</b>

Time (min)	CO <sub>2</sub> (%)	CO <sub>2</sub> (ppm)	NO <sub>x</sub> (ppm)	CO (ppm)	Remark
10:11	12.54	4.59	21.40	0.34	0.07
10:12	12.54	4.59	21.40	0.34	0.07
10:13	12.54	4.59	21.40	0.34	0.07
10:14	12.54	4.59	21.40	0.34	0.07
10:15	12.54	4.59	21.40	0.34	0.07
10:16	12.54	4.59	21.40	0.34	0.07
10:17	12.54	4.59	21.40	0.34	0.07
10:18	12.54	4.59	21.40	0.34	0.07
10:19	12.54	4.59	21.40	0.34	0.07
10:20	12.54	4.59	21.40	0.34	0.07
10:21	12.54	4.59	21.40	0.34	0.07
10:22	12.54	4.59	21.40	0.34	0.07
10:23	12.54	4.59	21.40	0.34	0.07
10:24	12.54	4.59	21.40	0.34	0.07
10:25	12.54	4.59	21.40	0.34	0.07
10:26	12.54	4.59	21.40	0.34	0.07
10:27	12.54	4.59	21.40	0.34	0.07
10:28	12.54	4.59	21.40	0.34	0.07
10:29	12.54	4.59	21.40	0.34	0.07
10:30	12.54	4.59	21.40	0.34	0.07
Average	12.54	4.59	21.40	0.34	0.07

(Mr. Uthmaniyah)

Environmental Field Scientist (E)

FORM NO. F-0002 REVISION NO. 2 ISSUE DATE: 2019/01

ALS Laboratory Group



## DIGITAL TEMPERATURE CALIBRATION DATA SHEET

Calibration Date: <b>3 Jan 23</b>	Assembled Temperature (°C): <b>30</b>
Calibration sheet No.: <b>C-030123-BKX_F50208</b>	Relative Humidity (%): <b>62</b>
Digital Temperature ID: <b>BKX_F50208</b>	Reference Temperature ID: <b>BKX_F51144</b>
Serial No.: <b>1503017</b>	Serial No.: <b>20100000013</b>
Model: <b>XC-472-V</b>	Model: <b>Digicon-CC-V1-488</b>
Next Calibrate: 31 Jan 23	

Location	Reference Temperature (°C)	Digital Temperature (°C)	Error	MPE	Pass / Fail
Block	0	0	0	± 0.3	Pass
	25	25	0	± 0.3	Pass
	50	50	1	± 0.3	Pass
	100	100	1	± 0.3	Pass
	150	150	1	± 0.3	Pass
Probe	120	121	1	± 0.3	Pass
	140	141	1	± 0.3	Pass
	160	160	0	± 0.3	Pass
	180	180	1	± 0.3	Pass
	200	200	1	± 0.3	Pass
Open	120	121	1	± 0.3	Pass
	140	141	1	± 0.3	Pass
	160	160	0	± 0.3	Pass
	180	180	1	± 0.3	Pass
	200	200	1	± 0.3	Pass
Filter	120	121	1	± 0.3	Pass
	140	141	1	± 0.3	Pass
	160	160	0	± 0.3	Pass
	180	180	1	± 0.3	Pass
	200	200	1	± 0.3	Pass
Exit	0	0	1	± 0.3	Pass
	25	25	0	± 0.3	Pass
	50	50	1	± 0.3	Pass
	100	100	1	± 0.3	Pass
	150	150	1	± 0.3	Pass
Water	0	0	0	± 0.3	Pass
	25	25	0	± 0.3	Pass
	50	50	0	± 0.3	Pass
	100	100	0	± 0.3	Pass
	150	150	0	± 0.3	Pass

MPE: (Maximum permissible error of measurement) as defined in the specification of the device.

Calibrated by: **Prasert S.** Approved by: **S.P.**

(Mr. Prasert Surachon) (Mr. Samet Rongman)

Field Scientist (2) Specialist (1)

FORM NO. F-0002 REVISION NO. 2 ISSUE DATE: 2019/01



## Stopwatch Calibration Test Report

Calibration Date: <b>3 Jan 23</b>	Next Cal. Date: <b>3 Jul 23</b>
Barometric Pressure (mmHg): <b>759</b>	Temperature (°C): <b>27.0</b>
Relative Humidity (%): <b>58.0</b>	

Reference Stopwatch Data	Console Control Meter Data
Stopwatch ID No.: <b>E18061</b>	Dry Gas Meter No.: <b>BKX_F50207</b>
Model: <b>FR08</b>	Model: <b>XC-572-V</b>
Serial No.: <b>+</b>	Serial No.: <b>1503017</b>
Calibration Date: <b>8 Sep 20</b>	
Certificate No.: <b>E-2009018</b>	

Run No.	Time Actual (min)	Time Reading (min)	Diff. (min)	Diff. (min)
1	5:00:11	5:00	11	0.00018
2	5:00:12	5:00	12	0.00020
3	5:00:11	5:00	11	0.00018
4	5:00:09	5:00	9	0.00015
5	5:00:07	5:00	7	0.00012
6	5:00:11	5:00	11	0.00018
7	5:00:11	5:00	11	0.00018
8	5:00:09	5:00	9	0.00015
9	5:00:11	5:00	11	0.00018
10	5:00:12	5:00	12	0.00020
Average				0.00017
SD				0.00003

Calibrate by:

Approved by:

Mr. Prasert Surachon

Mr. Samet Rongman

Field Scientist (2)

Specialist (1)



## Pilot Tube Calibration Data

Pilot Tube Identification Number: <b>BKX_F50211</b>	Calibration Date: <b>3 Jan 23</b>
Last test duct Number: <b>258-1-13-01</b>	Standard Pilot ID: <b>BKX_F50441</b>
Calibration Sheet No.: <b>C-030123-BKX_F50211</b>	Cp Standard: <b>0.99</b>

Test	Type & pilot tube	Standard pilot tube (ΔP, mm H <sub>2</sub> O)	Type & pilot tube (ΔP, mm H <sub>2</sub> O)	Cp (%)	
				Leg A	Leg B
Test 1	A	12.00	17.00	0.940	-
	B	12.00	17.00	-	0.940
Test 2	A	12.00	17.00	0.940	-
	B	12.00	17.00	-	0.940
Test 3	A	12.00	16.80	0.945	-
	B	12.00	16.80	-	0.945
				0.940	0.942

Calibrated by: **W. T.** Approved by: **S.P.**

(Mr. Wuttichai Tangmanee) (Mr. Samet Rongman)

Field Scientist (2) Specialist (1)

FORM NO. F-0002 REVISION NO. 2 ISSUE DATE: 2019/01



### Pitot Tube Calibration Data

Pitot Tube Identification Number : BKH\_F0012 Calibration Date : 3 Jan 23  
Lab test sheet Number : 258-1-13-01 Standard Pitot ID : BKH\_F0041  
Calibration Sheet No. : C-030123-BKH\_F0012 Cp Standard : 0.99

Type S Pitot Tube Coefficient Data					
Test	Type s pitot tube Leg A,B	Standard pitot tube (ΔP, mm H <sub>2</sub> O)	Type s pitot tube (ΔP, mm H <sub>2</sub> O)	Cp (s) Leg A	Cp (s) Leg B
Test 1	A	12.00	17.00	0.840	-
	B	12.00	17.00	-	0.840
Test 2	A	12.00	17.00	0.840	-
	B	12.00	17.00	-	0.840
Test 3	A	12.00	16.80	0.845	-
	B	12.00	16.80	-	0.845
				Cp	0.842 0.842

$$C_p = \frac{\Delta P}{\rho V^2 / 2}$$

$$C_p(A) - C_p(B) \text{ must be } \leq 0.01$$

$$\text{Average deviation (A or B)} = \frac{\sum [C_p(A) - C_p(B)]}{3} \text{ must be } \leq 0.01$$

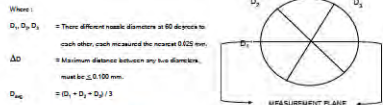
Calibrated by: [Signature] Approved by: [Signature]  
(Mr. Wanchai Tangsom) (Mr. Wanchai Tangsom)  
Field Scientist (2) Senior (1)

FORM NO. F-04-074 REVISION NO. 2 ISSUE DATE: 20/11/21



### PROBE NOZZLE DIAMETER CALIBRATION DATA SHEET

Calibration Date : 3 Jan 23		Nozzle Size ID : BKH_F0013			
Calibration Sheet No. : C-030123-BKH_F0013		Version Calibration ID : RVS_F0039			
Nozzle ID #	Nozzle Diameter (mm)			H - L	$(D_1 - D_2) / 3$
	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	$\Delta D$ D <sub>avg</sub>	
1	0.315	0.315	0.315	0.000	0.315
2	0.475	0.475	0.475	0.000	0.475
3	0.635	0.635	0.635	0.000	0.635
4	0.790	0.790	0.790	0.000	0.790
5	0.950	0.950	0.950	0.000	0.950
6	1.110	1.110	1.110	0.000	1.110
7	1.270	1.270	1.270	0.000	1.270
8	1.600	1.600	1.600	0.000	1.600



Calibrated by: [Signature] Approved by: [Signature]  
(Mr. Wanchai Tangsom) (Mr. Wanchai Tangsom)  
Field Scientist (2) Field Scientist (1)

FORM NO. F-04-074 REVISION NO. 2 ISSUE DATE: 20/11/21

Sartorius (Thailand) Co., Ltd.  
128 Rama 4 Road, Huaywang, Huaywang, Bangkok 10110  
Tel: +66 2643 8301-4 Fax: +66 2643 8302 e-mail: service.thailand@sartorius.com

### Certificate of Calibration

Model Number : MSE2245-100-DU Certificate No. : 230C10072  
Description : Analytical Balance Issued Date : Monday, February 13, 2023  
Serial Number : 26207042 Reference No. : 20245  
ID No. : BKH\_F0002  
Manufacturer : Sartorius Page No. : 1 of 2

Customer Name : ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanakan 40/Phatthanakan Rd., Khwaeng Phatthanakan, Khet Suan Luang, Bangkok 10250  
Calibrated Place : Balance Room

Calibrated By : Mr. Chonchai Inthas  
Calibration Date : Wednesday, February 08, 2023  
Calibration Procedure No. : This calibration was conducted by using in-house calibration procedure number (W-033)  
Based on UKAS LAB 14 : 2019

Metrological data : Capacity : 220 g Readability : 0.0001 g  
Reasons for calibration : ☐ New Installation ☐ Service / Repair ☒ In-Company Maintenance ☐ Good Quality ☐ Fit  
Ambient Conditions : Temperature : 23.2 °C ± 0.5 °C  
Humidity : 50.0 % RH ± 10.0 % RH  
Pressure : ±

Measurement Method : UKAS Publication Ref : Lab 14  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to the Expression of Uncertainty in Measurement (GUM). The calibration certificate documents the traceability to National Standards, which Sartorius Metrological Specifications.

Traceability : Model Number : Description : Transcendence : Certificate No. : Issue Date :  
230C11-522-00 Sartorius weight set, 1000g E2 YC0211-522-00 SPG-RIT 02021166 14-Sep-2023  
MSE-30202 Tarely/Balance/Temp Labon MSE-30202 DKH 11020444 05-Sep-2023

This certificate relates and apply the equipment only.  
The certificate may not be reproduced other than in full except with the prior written approval of the Verification Operator Division Sartorius (Thailand) Co., Ltd.  
SOP FM 33 03 February 2022

Sartorius (Thailand) Co., Ltd.  
128 Rama 4 Road, Huaywang, Huaywang, Bangkok 10110  
Tel: +66 2643 8301-4 Fax: +66 2643 8302 e-mail: service.thailand@sartorius.com

### Certificate of Calibration

Model Number : MSE2245-100-DU Certificate No. : 230C10072  
Description : Analytical Balance Issued Date : Monday, February 13, 2023  
Serial Number : 26207042 Reference No. : 20245  
ID No. : BKH\_F0002  
Manufacturer : Sartorius Page No. : 2 of 2

#### Calibration Results : Without Adjustment

Repeatability		Eccentricity (Off-center loading error)	
The repeatability is the ability of a weighing instrument to display nearly identical results upon repeated test conditions when the same test article is measured under the same conditions.		The off-center loading error is judged by the difference between the results of the test, in 10 g, of a test article placed in the middle of the weighing pan and around each of four different measurement points (positions defined according to OIML R111).	
Nominal Value (Low Load)	20.0000	200.0000	
20 g	20.0000	199.9999	
Tolerance	20.0000	200.0000	
0.0001 g	20.0000	199.9999	
Nominal Value (High Load)	200.0000	200.0000	
200 g	20.0000	199.9999	
Tolerance	20.0000	199.9999	
0.0001 g	20.0000	199.9999	
Standard Deviation		0.00000	

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

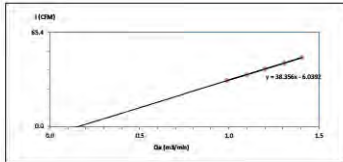
Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
0.1	0.1000	0.1000	0.0000	0.00014
0.1	0.1000	0.1000	0.0000	0.00014
1	1.0000	1.0000	0.0000	0.00014
1	1.0000	1.0000	0.0000	0.00014
2	2.0000	2.0000	0.0000	0.00014
2	2.0000	2.0000	0.0000	0.00014
5	5.0000	5.0000	0.0000	0.00014
5	5.0000	5.0000	0.0000	0.00014
10	10.0000	10.0000	0.0000	0.00014
10	10.0000	10.0000	0.0000	0.00014
20	20.0000	20.0000	0.0000	0.00014
20	20.0000	20.0000	0.0000	0.00014
50	50.0000	50.0000	0.0000	0.00014
50	50.0000	50.0000	0.0000	0.00014
100	100.0000	100.0000	0.0000	0.00014
100	100.0000	100.0000	0.0000	0.00014
200	200.0000	199.9999	-0.0001	0.00014

SOP FM 33 03 February 2022



### High Volume Air Sampler Calibration Worksheet

Project Site : Kaeng Khro Power Generation Company Limited		Barometric Pressure (mm Hg) : 756.6		
Calibration Location : Suvarnabhumi		Temperature (°C) : 32.0		
Calibration Date : 2-Jan-23		High Volume ID : BKH_F0040		
Calibration Sheet No. : C-021025-BKH_F0040		High Volume Model : TE-5000X		
Calibrator ID : BKH_F0042		High Volume S/N : 5086		
Calibrator Model : TE-5020A		Calibrator Slope : 1.03052		
Calibrator S/N : 2584		Calibrator Intercept : -0.01418		
Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>a</sub> (m³/min)	1-Chart (CFM)	Linear Regression
1	2.5	0.909	32	Slope: 36.3559
2	3.1	1.091	36	Intercept: -6.5932
3	3.7	1.267	40	Correlation Coefficient: 0.9996
4	4.4	1.397	44	
5	5.1	1.540	48	



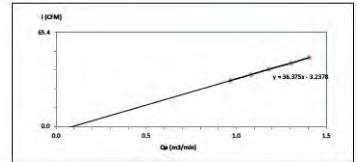
Calibrated by: [Signature] Approved by: [Signature]  
(Mr. Taweesak Solakul) (Mr. Wanchai Tangsom)  
BKH Field Service Scientist (2) Field Scientist Supervisor

FORM NO. F-04-074 REVISION NO. 2 ISSUE DATE: 20/11/21



### High Volume Air Sampler Calibration Worksheet

Project Site : <b>Kaeng Khro Power Generation Company Limited</b>		Barometric Pressure (mm Hg) : <b>756.6</b>																																
Calibration Location : <b>Suvarnabhumi</b>		Temperature (°C) : <b>32.0</b>																																
Calibration Date : <b>2-Jan-23</b>		High Volume ID : <b>BKH_F0040</b>																																
Calibration Sheet No. : <b>C-021025-BKH_F0040</b>		High Volume Model : <b>TE-5000X</b>																																
Calibrator ID : <b>BKH_F0042</b>		High Volume S/N : <b>5086</b>																																
Calibrator Model : <b>TE-5020A</b>		Calibrator Slope : <b>1.03052</b>																																
Calibrator S/N : <b>2584</b>		Calibrator Intercept : <b>-0.01418</b>																																
<table><tr><th>Test No.</th><th>Delta H<sub>2</sub>O (inch)</th><th>Q<sub>a</sub> (m³/min)</th><th>1-Chart (CFM)</th><th>Linear Regression</th></tr><tr><td>1</td><td>2.4</td><td>0.968</td><td>32</td><td>Slope: 36.3753</td></tr><tr><td>2</td><td>3.0</td><td>1.091</td><td>36</td><td>Intercept: -3.2378</td></tr><tr><td>3</td><td>3.6</td><td>1.267</td><td>40</td><td>Correlation Coefficient: 0.9996</td></tr><tr><td>4</td><td>4.4</td><td>1.396</td><td>44</td><td></td></tr><tr><td>5</td><td>5.1</td><td>1.505</td><td>48</td><td></td></tr></table>					Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>a</sub> (m³/min)	1-Chart (CFM)	Linear Regression	1	2.4	0.968	32	Slope: 36.3753	2	3.0	1.091	36	Intercept: -3.2378	3	3.6	1.267	40	Correlation Coefficient: 0.9996	4	4.4	1.396	44		5	5.1	1.505	48	
Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>a</sub> (m³/min)	1-Chart (CFM)	Linear Regression																														
1	2.4	0.968	32	Slope: 36.3753																														
2	3.0	1.091	36	Intercept: -3.2378																														
3	3.6	1.267	40	Correlation Coefficient: 0.9996																														
4	4.4	1.396	44																															
5	5.1	1.505	48																															



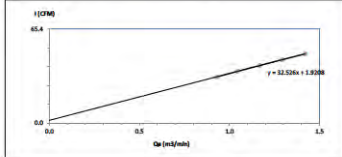
Calibrated by: [Signature] Approved by: [Signature]  
(Mr. Taweesak Solakul) (Mr. Wanchai Tangsom)  
BKH Field Service Scientist (2) Field Scientist Supervisor

FORM NO. F-04-074 REVISION NO. 2 ISSUE DATE: 20/11/21



### High Volume Air Sampler Calibration Worksheet

Project Site :		Kaeng Khro Power Generation Company Limited		Barometric Pressure (mm Hg) :		756.6	
Calibrate Location :		Suvarnabhumi		Temperature (°C) :		32.0	
Calibrate Date :		2-Jan-23		High Volume ID :		BKH_F0040	
Calibration Sheet No. :		C-021025-BKH_F0040		High Volume Model :		TE-5000X	
Calibrator ID :		BKH_F0042		High Volume S/N :		5086	
Calibrator Model :		TE-5020A		Calibrator Slope :		1.03052	
Calibrator S/N :		2584		Calibrator Intercept :		-0.01418	
				1-Chart			
Test No.		Delta H <sub>2</sub> O (inch)		Q <sub>a</sub> (m³/min)		CFM	
1		2.2		0.928		32	
2		2.8		1.046		36	
3		3.5		1.267		40	
4		4.3		1.262		44	
5		5.2		1.420		48	
				Linear Regression			
				Slope:		32.5258	
				Intercept:		1.9208	
				Correlation Coefficient:		0.9996	



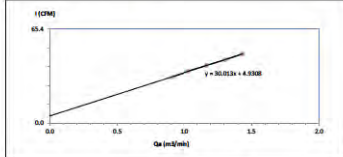
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FORM NO. F-04-074 REVISION NO. 2 ISSUE DATE: 20/11/21



### High Volume Air Sampler Calibration Worksheet

Project Site : <b>Kaeng Khro Power Generation Company Limited</b>		Barometric Pressure (mm Hg) : <b>756.6</b>		
Calibration Location : <b>Su-5</b>		Temperature (°C) : <b>32.0</b>		
Calibration Date : <b>2-Jan-23</b>		High Volume ID : <b>BKH_F0040</b>		
Calibration Sheet No. : <b>C-021025-BKH_F0040</b>		High Volume Model : <b>TE-5000X</b>		
Calibrator ID : <b>BKH_F0042</b>		High Volume S/N : <b>5086</b>		
Calibrator Model : <b>TE-5020A</b>		Calibrator Slope : <b>1.03052</b>		
Calibrator S/N : <b>2584</b>		Calibrator Intercept : <b>-0.01418</b>		
<hr/>				
<b>Test No.</b>	<b>Delta H<sub>2</sub>O (inch)</b>	<b>Q<sub>a</sub> (m³/min)</b>	<b>1-Chart (CFM)</b>	<b>Linear Regression</b>
1	2.1	0.907	32	Slope: <b>30.0131</b> Intercept: <b>4.9308</b> Correlation Coefficient: <b>0.9996</b>
2	2.7	1.027	36	
3	3.5	1.267	40	
4	4.4	1.307	44	
5	5.3	1.453	48	



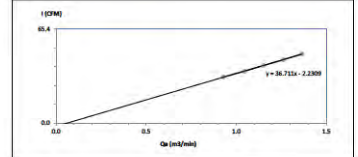
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FORM NO. F-04-074 REVISION NO. 2 ISSUE DATE: 20/11/21



### High Volume Air Sampler Calibration Worksheet

Project Site : <u>Kaeng Khro Power Generation Company Limited</u>		Barometric Pressure (mm Hg) : <u>756.6</u>	
Calibration Location : <u>Suvarnabhumi</u>		Temperature (°C) : <u>32.0</u>	
Calibration Date : <u>2-Jan-23</u>		High Volume ID : <u>BKH_F0040</u>	
Calibration Sheet No. : <u>C-021025-BKH_F0040</u>		High Volume Model : <u>TE-5000X</u>	
Calibrator ID : <u>BKH_F0042</u>		High Volume S/N : <u>5086</u>	
Calibrator Model : <u>TE-5020A</u>		Calibrator Slope : <u>1.03052</u>	
Calibrator S/N : <u>2584</u>		Calibrator Intercept : <u>-0.01418</u>	
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><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Calibrated by: [Signature] Approved by: [Signature]  
(Mr. Taweesak Solakul) (Mr. Wanchai Tangsom)  
BKH Field Service Scientist (2) Field Scientist Supervisor

FORM NO. F-04-074 REVISION NO. 2 ISSUE DATE: 20/11/21





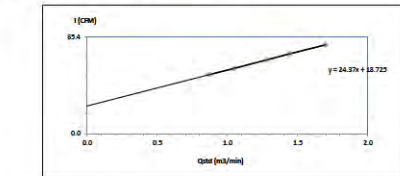




### High Volume Air Sampler Calibration Worksheet

Project Site: Kaeng Khoi Power Generation Company Limited  
Barometric Pressure (mm Hg): 756.6  
Calibrate Location: TeNurung  
Calibrate Date: 2-Oct-25  
Calibration Sheet No.: C-021025-BKK-FS1485  
Calibrator ID: BKK-FS0624  
Calibrator S/N: TE-5028A  
Calibrator Interceptor: 0.02267

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>air</sub> (m <sup>3</sup> /min)	1:1 Chart (CFM)
1	2.0	0.9708	40
2	2.9	1.3439	44
3	4.4	1.2806	50
4	5.6	1.4418	54
5	7.8	1.4975	60



Calibrated by: Mr. Teerarat Solides  
BKK Field Services Scientist (2)

Approved by: Mr. Warakorn Poolrak  
Field Services Supervisor

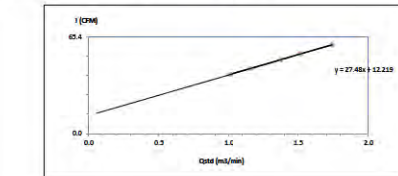
FORM NO. F-6-073 REVISION NO. 2 ISSUE DATE 20/11/23



### High Volume Air Sampler Calibration Worksheet

Project Site: Kaeng Khoi Power Generation Company Limited  
Barometric Pressure (mm Hg): 756.6  
Calibrate Location: TeNurung  
Calibrate Date: 2-Oct-25  
Calibration Sheet No.: C-021025-BKK-FS0373  
Calibrator ID: BKK-FS0624  
Calibrator S/N: TE-5028A  
Calibrator Interceptor: 0.02267

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>air</sub> (m <sup>3</sup> /min)	1:1 Chart (CFM)
1	2.7	1.0081	40
2	3.6	1.3465	44
3	5.1	1.3770	50
4	6.2	1.5159	54
5	8.2	1.7399	60



Calibrated by: Mr. Teerarat Solides  
BKK Field Services Scientist (2)

Approved by: Mr. Warakorn Poolrak  
Field Services Supervisor

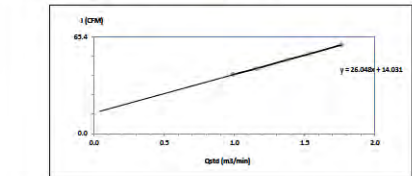
FORM NO. F-6-073 REVISION NO. 2 ISSUE DATE 20/11/23



### High Volume Air Sampler Calibration Worksheet

Project Site: Kaeng Khoi Power Generation Company Limited  
Barometric Pressure (mm Hg): 756.6  
Calibrate Location: TeNurung  
Calibrate Date: 2-Oct-25  
Calibration Sheet No.: C-021025-BKK-FS1484  
Calibrator ID: BKK-FS0624  
Calibrator S/N: TE-5028A  
Calibrator Interceptor: 0.02267

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>air</sub> (m <sup>3</sup> /min)	1:1 Chart (CFM)
1	2.6	0.9897	40
2	3.6	1.3405	44
3	5.1	1.3770	50
4	6.4	1.3398	54
5	8.4	1.7608	60



Calibrated by: Mr. Teerarat Solides  
BKK Field Services Scientist (2)

Approved by: Mr. Warakorn Poolrak  
Field Services Supervisor

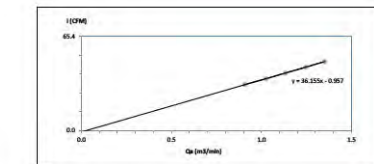
FORM NO. F-6-073 REVISION NO. 2 ISSUE DATE 20/11/23



### High Volume Air Sampler Calibration Worksheet

Project Site: Kaeng Khoi Power Generation Company Limited  
Barometric Pressure (mm Hg): 756.6  
Calibrate Location: TeNurung  
Calibrate Date: 2-Oct-25  
Calibration Sheet No.: C-021025-BKK-FS0374  
Calibrator ID: BKK-FS0624  
Calibrator S/N: TE-5028A  
Calibrator Interceptor: 0.01418

Test No.	Delta H <sub>2</sub> O (inch)	Q <sub>air</sub> (m <sup>3</sup> /min)	1:1 Chart (CFM)
1	2.1	0.907	32
2	2.7	1.027	36
3	3.5	1.234	44
4	4.6	1.247	44
5	4.7	1.259	48



Calibrated by: Mr. Teerarat Solides  
BKK Field Services Scientist (2)

Approved by: Mr. Warakorn Poolrak  
Field Services Supervisor

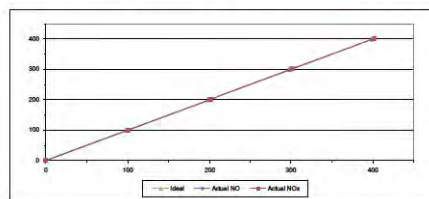
FORM NO. F-6-074 REVISION NO. 2 ISSUE DATE 20/11/23



### MULTIPOINT CALIBRATION REPORT

Calibration Date: 2-Jul-25  
Manufacturer: HORIBA  
Serial No.: PHD13MCT  
Calibrator Manufacturer: Teledyne API  
Serial No.: 947  
Std. Gas Concentration (PPM): 88.88  
Cylinder Pressure (psi): 1800  
Certified Date: 9-Feb-22

Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.80	-1.20	-1.20	100.80	0.80	0.80
2	200.00	201.40	1.40	0.70	200.60	-0.40	-0.20
3	300.00	298.30	-1.70	-0.57	301.80	1.80	0.60
4	400.00	398.50	-1.50	-0.38	401.40	1.40	0.35
AVERAGE (%)				-0.27			0.36



Calibrated By: Mr. Jirawat Sakam  
Field Environmental Scientist (3)

Approved By: Mr. Sarafuh Jitranont  
Assistant General Manager

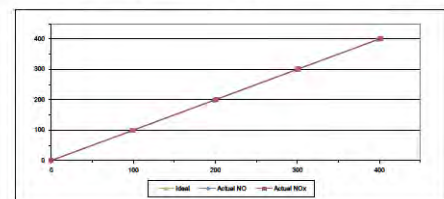
FORM NO. F-6-056 REVISION NO. 1 ISSUE DATE 02/04/22



### MULTIPOINT CALIBRATION REPORT

Calibration Date: 3-Jul-25  
Manufacturer: HORIBA  
Serial No.: SUDLSMUJ  
Calibrator Manufacturer: Teledyne API  
Serial No.: 947  
Std. Gas Concentration (PPM): 88.88  
Cylinder Pressure (psi): 1800  
Certified Date: 9-Feb-22

Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.70	-0.30	-0.30	99.10	-0.90	-0.90
2	200.00	198.30	-1.70	-0.85	201.60	1.60	0.75
3	300.00	299.30	-0.70	-0.23	301.10	1.10	0.37
4	400.00	398.30	-1.70	-0.42	401.20	1.20	0.30
AVERAGE (%)				-0.44			0.12



Calibrated By: Mr. Jirawat Sakam  
Field Environmental Scientist (3)

Approved By: Mr. Sarafuh Jitranont  
Assistant General Manager

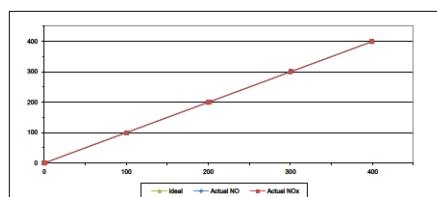
FORM NO. F-6-056 REVISION NO. 1 ISSUE DATE 02/04/22



### MULTIPOINT CALIBRATION REPORT

Calibration Date: 2-Jul-25  
Manufacturer: HORIBA  
Serial No.: TLTATGZW  
Calibrator Manufacturer: Teledyne API  
Serial No.: 947  
Std. Gas Concentration (PPM): 88.88  
Cylinder Pressure (psi): 1800  
Certified Date: 9-Feb-22

Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.00	-1.00	-1.00	100.30	0.30	0.30
2	200.00	199.40	-0.60	-0.30	200.60	0.60	0.30
3	300.00	299.00	-1.00	-0.33	301.00	1.00	0.33
4	400.00	398.70	-1.30	-0.33	399.30	-0.70	-0.17
AVERAGE (%)				-0.37			0.16



Calibrated By: Mr. Jirawat Sakam  
Field Environmental Scientist (3)

Approved By: Mr. Sarafuh Jitranont  
Assistant General Manager

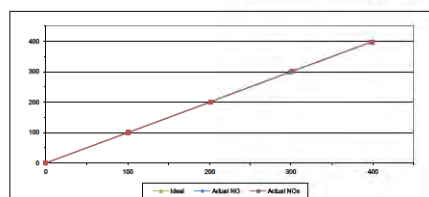
FORM NO. F-6-056 REVISION NO. 1 ISSUE DATE 02/04/22



### MULTIPOINT CALIBRATION REPORT

Calibration Date: 2-Jul-25  
Manufacturer: HORIBA  
Serial No.: PPGMBHCH  
Calibrator Manufacturer: Teledyne API  
Serial No.: 947  
Std. Gas Concentration (PPM): 88.88  
Cylinder Pressure (psi): 1800  
Certified Date: 9-Feb-22

Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	98.80	-1.20	-1.20	100.80	0.80	0.80
2	200.00	201.30	1.30	0.65	201.40	1.40	0.70
3	300.00	298.30	-1.70	-0.57	301.60	1.60	0.50
4	400.00	398.80	-1.20	-0.30	399.60	-1.40	-0.35
AVERAGE (%)				-0.26			0.29



Calibrated By: Mr. Jirawat Sakam  
Field Environmental Scientist (3)

Approved By: Mr. Sarafuh Jitranont  
Assistant General Manager

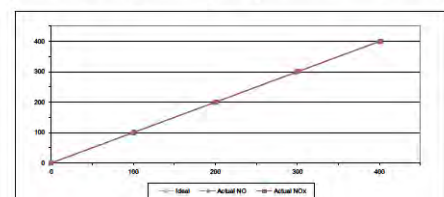
FORM NO. F-6-056 REVISION NO. 1 ISSUE DATE 02/04/22



### MULTIPOINT CALIBRATION REPORT

Calibration Date: 2-Jul-25  
Manufacturer: HORIBA  
Serial No.: HCWWRM81  
Calibrator Manufacturer: Teledyne API  
Serial No.: 947  
Std. Gas Concentration (PPM): 88.88  
Cylinder Pressure (psi): 1800  
Certified Date: 9-Feb-22

Point	Ideal	Actual NO	Error NO	%Error NO	Actual NOx	Error NOx	%Error NOx
ZERO	0.00	0.10	0.10	0.10	0.10	0.10	0.10
1	100.00	99.10	-0.90	-0.90	100.50	0.50	0.50
2	200.00	198.60	-1.40	-0.70	201.40	1.40	0.70
3	300.00	298.00	-2.00	-0.67	301.30	1.30	0.43
4	400.00	398.70	-1.30	-0.33	401.30	1.30	0.33
AVERAGE (%)				-0.60			0.41



Calibrated By: Mr. Jirawat Sakam  
Field Environmental Scientist (3)

Approved By: Mr. Sarafuh Jitranont  
Assistant General Manager

FORM NO. F-6-056 REVISION NO. 1 ISSUE DATE 02/04/22



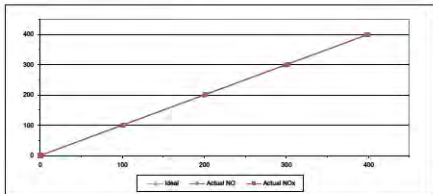


## MULTIPOINT CALIBRATION REPORT

Calibration Date: 2-Jul-26  
 Manufacturer: HORIBA  
 Serial No.: R26029EW  
 Calibrator Manufacturer: Telefine API  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 86.88  
 Cylinder Pressure (psi): 1800  
 Certified Date: 9-Feb-22

Equipment Name: NOx Analyzer  
 Model: APNA-370  
 Equipment ID: BKK\_F30789  
 Model: 700  
 Cylinder No.: GN0027222  
 Certified By: Aigas Inc.  
 Expired Date: 9-Feb-30

CALIBRATION RESULTS						
Point	Ideal	Actual	Error	%Error	Actual	%Error
ZERO	0.00	0.10	0.10	0.10	0.10	0.10
1	100.00	99.00	-1.00	-1.00	101.10	1.10
2	200.00	199.50	-0.50	-0.25	201.10	0.55
3	300.00	298.50	-1.50	-0.50	301.20	0.40
4	400.00	398.50	-1.50	-0.38	398.50	-0.38
AVERAGE (%)						
				-0.42		0.36



Calibrated By

Approved By

(Mr. Jirawat Sakam)  
 Field Environmental Scientist (3)

(Mr. Saraphut Jitramont)  
 Assistant General Manager

ALS Laboratory Group  
 FORM NO. F-06-056 REVISION NO. 1 ISSUE DATE: 02/04/12

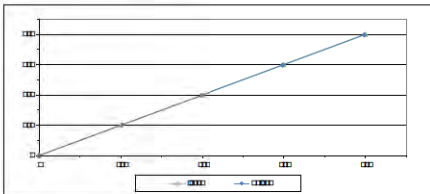


## MULTIPOINT CALIBRATION REPORT

Calibration Date: 1-Jul-26  
 Manufacturer: HORIBA  
 Serial No.: R26029EW  
 Calibrator Manufacturer: Telefine API  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 86.3  
 Cylinder Pressure (psi): 1800  
 Certified Date: 9-Feb-22

Equipment Name: SO2 Analyzer  
 Model: APNA-370  
 Equipment ID: BKK\_F31071  
 Model: 700  
 Cylinder No.: GN0027222  
 Certified By: Aigas Inc.  
 Expired Date: 9-Feb-30

CALIBRATION RESULTS						
Point	Ideal	Actual	Error	%Error	Actual	%Error
ZERO	0.00	0.10	0.10	0.10	0.10	0.10
1	100.00	101.20	1.20	1.20	1.20	1.20
2	200.00	198.50	-1.50	-0.75	1.20	0.60
3	300.00	298.50	-1.50	-0.50	1.20	0.40
4	400.00	398.50	-1.50	-0.38	1.20	0.30
AVERAGE (%)						
				-0.11		



Calibrated By

Approved By

(Mr. Jirawat Sakam)  
 Field Environmental Scientist (3)

(Mr. Saraphut Jitramont)  
 Assistant General Manager

ALS Laboratory Group  
 FORM NO. F-06-056 REVISION NO. 1 ISSUE DATE: 02/04/12

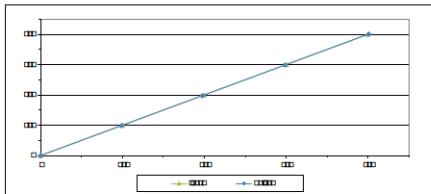


## MULTIPOINT CALIBRATION REPORT

Calibration Date: 2-Jul-26  
 Manufacturer: HORIBA  
 Serial No.: X0YVY1AU  
 Calibrator Manufacturer: Telefine API  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 86.3  
 Cylinder Pressure (psi): 1800  
 Certified Date: 9-Feb-22

Equipment Name: SO2 Analyzer  
 Model: APNA-370  
 Equipment ID: BKK\_F31089  
 Model: 700  
 Cylinder No.: GN0027222  
 Certified By: Aigas Inc.  
 Expired Date: 9-Feb-30

CALIBRATION RESULTS						
Point	Ideal	Actual	Error	%Error	Actual	%Error
ZERO	0.00	0.10	0.10	0.10	0.10	0.10
1	100.00	99.80	-0.20	-0.20	1.20	1.20
2	200.00	197.40	-2.60	-1.30	1.20	0.60
3	300.00	298.50	-1.50	-0.50	1.20	0.40
4	400.00	401.00	1.00	0.25	1.20	0.30
AVERAGE (%)						
				-0.84		



Calibrated By

Approved By

(Mr. Jirawat Sakam)  
 Field Environmental Scientist (3)

(Mr. Saraphut Jitramont)  
 Assistant General Manager

ALS Laboratory Group  
 FORM NO. F-06-056 REVISION NO. 1 ISSUE DATE: 02/04/12

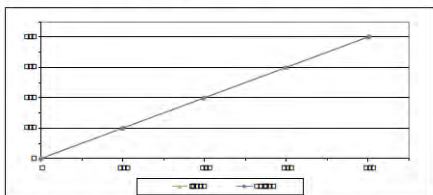


## MULTIPOINT CALIBRATION REPORT

Calibration Date: 1-Jul-26  
 Manufacturer: HORIBA  
 Serial No.: 3C72K8HS  
 Calibrator Manufacturer: Telefine API  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 86.3  
 Cylinder Pressure (psi): 1800  
 Certified Date: 9-Feb-22

Equipment Name: SO2 Analyzer  
 Model: APNA-370  
 Equipment ID: BKK\_F30784  
 Model: 700  
 Cylinder No.: GN0027222  
 Certified By: Aigas Inc.  
 Expired Date: 9-Feb-30

CALIBRATION RESULTS						
Point	Ideal	Actual	Error	%Error	Actual	%Error
ZERO	0.00	0.10	0.10	0.10	0.10	0.10
1	100.00	99.60	-0.40	-0.40	1.20	1.20
2	200.00	198.60	-1.40	-0.70	1.20	0.60
3	300.00	298.60	-1.40	-0.47	1.20	0.40
4	400.00	401.20	1.20	0.30	1.20	0.30
AVERAGE (%)						
				-0.28		



Calibrated By

Approved By

(Mr. Jirawat Sakam)  
 Field Environmental Scientist (3)

(Mr. Saraphut Jitramont)  
 Assistant General Manager

ALS Laboratory Group  
 FORM NO. F-06-056 REVISION NO. 1 ISSUE DATE: 02/04/12

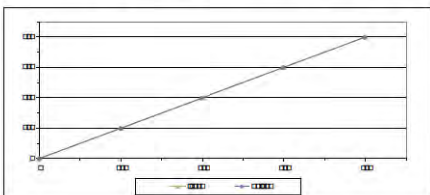


## MULTIPOINT CALIBRATION REPORT

Calibration Date: 1-Jul-26  
 Manufacturer: HORIBA  
 Serial No.: 70Y1R8RD  
 Calibrator Manufacturer: Telefine API  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 86.3  
 Cylinder Pressure (psi): 1800  
 Certified Date: 9-Feb-22

Equipment Name: SO2 Analyzer  
 Model: APNA-370  
 Equipment ID: BKK\_F31069  
 Model: 700  
 Cylinder No.: GN0027222  
 Certified By: Aigas Inc.  
 Expired Date: 9-Feb-30

CALIBRATION RESULTS						
Point	Ideal	Actual	Error	%Error	Actual	%Error
ZERO	0.00	0.10	0.10	0.10	0.10	0.10
1	100.00	99.30	-0.70	-0.70	1.20	1.20
2	200.00	198.60	-1.40	-0.70	1.20	0.60
3	300.00	298.60	-1.40	-0.47	1.20	0.40
4	400.00	398.60	-1.40	-0.35	1.20	0.30
AVERAGE (%)						
				-0.48		



Calibrated By

Approved By

(Mr. Jirawat Sakam)  
 Field Environmental Scientist (3)

(Mr. Saraphut Jitramont)  
 Assistant General Manager

ALS Laboratory Group  
 FORM NO. F-06-056 REVISION NO. 1 ISSUE DATE: 02/04/12

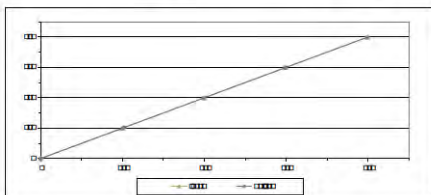


## MULTIPOINT CALIBRATION REPORT

Calibration Date: 1-Jul-26  
 Manufacturer: HORIBA  
 Serial No.: YU8Y8Y8Y  
 Calibrator Manufacturer: Telefine API  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 86.3  
 Cylinder Pressure (psi): 1800  
 Certified Date: 9-Feb-22

Equipment Name: SO2 Analyzer  
 Model: APNA-370  
 Equipment ID: BKK\_F30799  
 Model: 700  
 Cylinder No.: GN0027222  
 Certified By: Aigas Inc.  
 Expired Date: 9-Feb-30

CALIBRATION RESULTS						
Point	Ideal	Actual	Error	%Error	Actual	%Error
ZERO	0.00	0.10	0.10	0.10	0.10	0.10
1	100.00	101.30	1.30	1.30	1.20	1.20
2	200.00	199.10	-0.90	-0.45	1.20	0.60
3	300.00	298.60	-1.40	-0.47	1.20	0.40
4	400.00	398.60	-1.40	-0.35	1.20	0.30
AVERAGE (%)						
				0.02		



Calibrated By

Approved By

(Mr. Jirawat Sakam)  
 Field Environmental Scientist (3)

(Mr. Saraphut Jitramont)  
 Assistant General Manager

ALS Laboratory Group  
 FORM NO. F-06-056 REVISION NO. 1 ISSUE DATE: 02/04/12

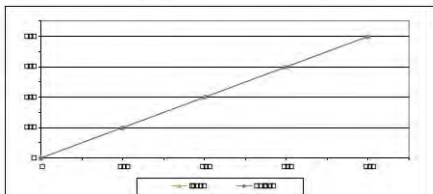


## MULTIPOINT CALIBRATION REPORT

Calibration Date: 1-Jul-26  
 Manufacturer: HORIBA  
 Serial No.: PFDWYVU  
 Calibrator Manufacturer: Telefine API  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 86.3  
 Cylinder Pressure (psi): 1800  
 Certified Date: 9-Feb-22

Equipment Name: SO2 Analyzer  
 Model: APNA-370  
 Equipment ID: BKK\_F30788  
 Model: 700  
 Cylinder No.: GN0027222  
 Certified By: Aigas Inc.  
 Expired Date: 9-Feb-30

CALIBRATION RESULTS						
Point	Ideal	Actual	Error	%Error	Actual	%Error
ZERO	0.00	0.05	0.05	0.05	0.05	0.05
1	100.00	99.10	-0.90	-0.90	1.20	1.20
2	200.00	201.30	1.30	0.65	1.20	0.60
3	300.00	298.60	-1.40	-0.47	1.20	0.40
4	400.00	398.60	-1.40	-0.35	1.20	0.30
AVERAGE (%)						
				-0.22		



Calibrated By

Approved By

(Mr. Jirawat Sakam)  
 Field Environmental Scientist (3)

(Mr. Saraphut Jitramont)  
 Assistant General Manager

ALS Laboratory Group  
 FORM NO. F-06-056 REVISION NO. 1 ISSUE DATE: 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date: 1-Jul-26  
 Manufacturer: HORIBA  
 Serial No.: PFDWYVU  
 Calibrator Manufacturer: Telefine API  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 86.3  
 Cylinder Pressure (psi): 1800  
 Certified Date: 9-Feb-22

Equipment Name: SO2 Analyzer  
 Model: APNA-370  
 Equipment ID: BKK\_F30788  
 Model: 700  
 Cylinder No.: GN0027222  
 Certified By: Aigas Inc.  
 Expired Date: 9-Feb-30

CALIBRATION RESULTS						
Point	Ideal	Actual	Error	%Error	Actual	%Error
ZERO	0.00	0.05	0.05	0.05	0.05	0.05
1	100.00	99.10	-0.90	-0.90	1.20	1.20
2	200.00	201.30	1.30	0.65	1.20	0.60
3	300.00	298.60	-1.40	-0.47	1.20	0.40
4	400.00	398.60	-1.40	-0.35	1.20	0.30
AVERAGE (%)						
				-0.22		



Calibrated By

Approved By

(Mr. Jirawat Sakam)  
 Field Environmental Scientist (3)

(Mr. Saraphut Jitramont)  
 Assistant General Manager

ALS Laboratory Group  
 FORM NO. F-06-056 REVISION NO. 1 ISSUE DATE: 02/04/12



## MULTIPOINT CALIBRATION REPORT

Calibration Date: 1-Jul-26  
 Manufacturer: HORIBA  
 Serial No.: PFDWYVU  
 Calibrator Manufacturer: Telefine API  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 86.3  
 Cylinder Pressure (psi): 1800  
 Certified Date: 9-Feb-22

Equipment Name: SO2 Analyzer  
 Model: APNA-370  
 Equipment ID: BKK\_F30788  
 Model: 700  
 Cylinder No.: GN0027222  
 Certified By: Aigas Inc.  
 Expired Date: 9-Feb-30

CALIBRATION RESULTS						
Point	Ideal	Actual	Error	%Error	Actual	%Error
ZERO	0.00	0.05	0.05	0.05	0.05	0.05
1	100.00	99.10	-0.90	-0.90	1.20	1.20
2	200.00	201.30	1.30	0.65	1.20	0.60
3	300.00	298.60	-1.40	-0.47	1.20	0.40
4	400.00	398.60	-1.40	-0.35	1.20	0.30
AVERAGE (%)						
				-0.22		



Calibrated By

Approved By

(Mr. Jirawat Sakam)  
 Field Environmental Scientist (3)

(Mr. Saraphut Jitramont)  
 Assistant General Manager

ALS Laboratory Group  
 FORM NO. F-06-056 REVISION NO. 1 ISSUE DATE: 02/04/12

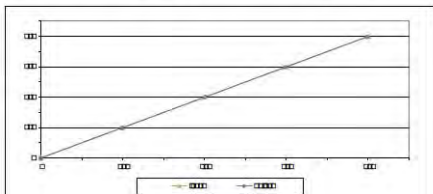


## MULTIPOINT CALIBRATION REPORT

Calibration Date: 1-Jul-26  
 Manufacturer: HORIBA  
 Serial No.: PFDWYVU  
 Calibrator Manufacturer: Telefine API  
 Serial No.: 947  
 Std. Gas Concentration (PPM): 86.3  
 Cylinder Pressure (psi): 1800  
 Certified Date: 9-Feb-22

Equipment Name: SO2 Analyzer  
 Model: APNA-370  
 Equipment ID: BKK\_F30788  
 Model: 700  
 Cylinder No.: GN0027222  
 Certified By: Aigas Inc.  
 Expired Date: 9-Feb-30

CALIBRATION RESULTS						
Point	Ideal	Actual	Error	%Error	Actual	%Error
ZERO	0.00	0.05	0.05	0.05	0.05	0.05
1	100.00	99.10	-0.90	-0.90	1.20	1.20
2	200.00	201.30	1.30	0.65	1.20	0.60
3	300.00	298.60	-1.40	-0.47	1.20	0.40
4	400.00	398.60	-1.40	-0.35	1.20	0.30
AVERAGE (%)						
				-0.22		



Calibrated By

Approved By



Page 1 of 2 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: [Blank]  
MODEL/TYPE: [Blank]  
SERIAL NUMBER: [Blank]  
CONDITION AS-RECEIVED: [Blank]  
CUSTOMER: [Blank]

**RECEIVED DATE**  
MEASUREMENT DATE: [Blank]  
ISSUE DATE: [Blank]

**ENVIRONMENTAL CONDITIONS:**  
Ambient condition in the laboratory are as follow:  
Temperature: 23.0 ± 0.2 °C  
Relative Humidity: 55.0 ± 0.5 %RH  
Atmospheric Pressure: 1013.0 ± 0.3 hPa

**PLACE OF CALIBRATION**  
[Blank]

**CALIBRATION CONDITION**  
Wind tunnel cross section area: 300 cm²  
Wind direction (upstream): 120°  
Direction of measuring plane: 0°  
Blockage ratio of test object: 0.143

**Prescribing Measurement Condition**  
24 hours at different conditions.  
(The average value during measurement are 23.0 ± 0.2 °C, 55.0 ± 0.5 %RH and 1013.0 ± 0.3 hPa)

**TABULATION OF RESULTS**  
The table on next page give the measured values.

Calibrated by: [Signature]  
[Blank]  
[Blank]

Approved signature: [Signature]  
Mr. Parinya Booncharoen  
Calibration Department Manager

\*\*\*\*\*End of Certificate of Calibration\*\*\*\*\*

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

Page 2 of 2 Pages

**MEASUREMENT RESULTS**

Air speed	D <sub>ref</sub>	D <sub>ref</sub>	D <sub>ref</sub>	D <sub>ref</sub>
m/s	mm	mm	mm	mm
45.000	45.000	45.000	45.000	45.000
90.000	90.000	90.000	90.000	90.000
135.000	135.000	135.000	135.000	135.000
180.000	180.000	180.000	180.000	180.000
225.000	225.000	225.000	225.000	225.000
270.000	270.000	270.000	270.000	270.000
315.000	315.000	315.000	315.000	315.000
360.000	360.000	360.000	360.000	360.000

**Remarks:**  
Calibration is only for use for the laboratory and environmental conditions during which the calibration took place.  
Direction of wind:  
Direction of flow calibration:  
Direction of flow calibration:  
Direction of flow calibration:

\*\*\*\*\*End of Certificate of Calibration\*\*\*\*\*

Page 1 of 2 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: [Blank]  
MODEL/TYPE: [Blank]  
SERIAL NUMBER: [Blank]  
CONDITION AS-RECEIVED: [Blank]  
CUSTOMER: [Blank]

**RECEIVED DATE**  
MEASUREMENT DATE: [Blank]  
ISSUE DATE: [Blank]

**ENVIRONMENTAL CONDITIONS:**  
Ambient condition in the laboratory are as follow:  
Temperature: 23.0 ± 0.2 °C  
Relative Humidity: 55.0 ± 0.5 %RH

**PLACE OF CALIBRATION**  
[Blank]

**CALIBRATION CONDITION**  
Wind tunnel cross section area: 300 cm²  
Wind direction (upstream): 120°  
Direction of measuring plane: 0°  
Blockage ratio of test object: 0.143

**Prescribing Measurement Condition**  
24 hours at different conditions.  
(The average value during measurement are 23.0 ± 0.2 °C, 55.0 ± 0.5 %RH and 1013.0 ± 0.3 hPa)

**TABULATION OF RESULTS**  
The table on next page give the measured values.

Calibrated by: [Signature]  
[Blank]  
[Blank]

Approved signature: [Signature]  
Mr. Parinya Booncharoen  
Calibration Department Manager

\*\*\*\*\*End of Certificate of Calibration\*\*\*\*\*

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Page 1 of 2 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: [Blank]  
MODEL/TYPE: [Blank]  
SERIAL NUMBER: [Blank]  
CONDITION AS-RECEIVED: [Blank]  
CUSTOMER: [Blank]

**RECEIVED DATE**  
MEASUREMENT DATE: [Blank]  
ISSUE DATE: [Blank]

**ENVIRONMENTAL CONDITIONS:**  
Ambient condition in the laboratory are as follow:  
Temperature: 23.0 ± 0.2 °C  
Relative Humidity: 55.0 ± 0.5 %RH  
Atmospheric Pressure: 1013.0 ± 0.3 hPa

**PLACE OF CALIBRATION**  
[Blank]

**CALIBRATION CONDITION**  
Wind tunnel cross section area: 300 cm²  
Wind direction (upstream): 120°  
Direction of measuring plane: 0°  
Blockage ratio of test object: 0.143

**Prescribing Measurement Condition**  
24 hours at different conditions.  
(The average value during measurement are 23.0 ± 0.2 °C, 55.0 ± 0.5 %RH and 1013.0 ± 0.3 hPa)

**TABULATION OF RESULTS**  
The table on next page give the measured values.

Calibrated by: [Signature]  
[Blank]  
[Blank]

Approved signature: [Signature]  
Mr. Parinya Booncharoen  
Calibration Department Manager

\*\*\*\*\*End of Certificate of Calibration\*\*\*\*\*

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Page 2 of 2 Pages

**MEASUREMENT RESULTS**

Air speed	D <sub>ref</sub>	D <sub>ref</sub>	D <sub>ref</sub>	D <sub>ref</sub>
m/s	mm	mm	mm	mm
45.000	45.000	45.000	45.000	45.000
90.000	90.000	90.000	90.000	90.000
135.000	135.000	135.000	135.000	135.000
180.000	180.000	180.000	180.000	180.000
225.000	225.000	225.000	225.000	225.000
270.000	270.000	270.000	270.000	270.000
315.000	315.000	315.000	315.000	315.000
360.000	360.000	360.000	360.000	360.000

**Remarks:**  
Calibration is only for use for the laboratory and environmental conditions during which the calibration took place.  
Direction of wind:  
Direction of flow calibration:  
Direction of flow calibration:  
Direction of flow calibration:

\*\*\*\*\*End of Certificate of Calibration\*\*\*\*\*

Page 1 of 2 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: [Blank]  
MODEL/TYPE: [Blank]  
SERIAL NUMBER: [Blank]  
CONDITION AS-RECEIVED: [Blank]  
CUSTOMER: [Blank]

**RECEIVED DATE**  
MEASUREMENT DATE: [Blank]  
ISSUE DATE: [Blank]

**ENVIRONMENTAL CONDITIONS:**  
Ambient condition in the laboratory are as follow:  
Temperature: 23.0 ± 0.2 °C  
Relative Humidity: 55.0 ± 0.5 %RH

**PLACE OF CALIBRATION**  
[Blank]

**CALIBRATION CONDITION**  
Wind tunnel cross section area: 300 cm²  
Wind direction (upstream): 120°  
Direction of measuring plane: 0°  
Blockage ratio of test object: 0.143

**Prescribing Measurement Condition**  
24 hours at different conditions.  
(The average value during measurement are 23.0 ± 0.2 °C, 55.0 ± 0.5 %RH and 1013.0 ± 0.3 hPa)

**TABULATION OF RESULTS**  
The table on next page give the measured values.

Calibrated by: [Signature]  
[Blank]  
[Blank]

Approved signature: [Signature]  
Mr. Parinya Booncharoen  
Calibration Department Manager

\*\*\*\*\*End of Certificate of Calibration\*\*\*\*\*

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Page 1 of 2 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: [Blank]  
MODEL/TYPE: [Blank]  
SERIAL NUMBER: [Blank]  
CONDITION AS-RECEIVED: [Blank]  
CUSTOMER: [Blank]

**RECEIVED DATE**  
MEASUREMENT DATE: [Blank]  
ISSUE DATE: [Blank]

**ENVIRONMENTAL CONDITIONS:**  
Ambient condition in the laboratory are as follow:  
Temperature: 23.0 ± 0.2 °C  
Relative Humidity: 55.0 ± 0.5 %RH  
Atmospheric Pressure: 1013.0 ± 0.3 hPa

**PLACE OF CALIBRATION**  
[Blank]

**CALIBRATION CONDITION**  
Wind tunnel cross section area: 300 cm²  
Wind direction (upstream): 120°  
Direction of measuring plane: 0°  
Blockage ratio of test object: 0.143

**Prescribing Measurement Condition**  
24 hours at different conditions.  
(The average value during measurement are 23.0 ± 0.2 °C, 55.0 ± 0.5 %RH and 1013.0 ± 0.3 hPa)

**TABULATION OF RESULTS**  
The table on next page give the measured values.

Calibrated by: [Signature]  
[Blank]  
[Blank]

Approved signature: [Signature]  
Mr. Parinya Booncharoen  
Calibration Department Manager

\*\*\*\*\*End of Certificate of Calibration\*\*\*\*\*

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Page 2 of 2 Pages

**MEASUREMENT RESULTS**

Air speed	D <sub>ref</sub>	D <sub>ref</sub>	D <sub>ref</sub>	D <sub>ref</sub>
m/s	mm	mm	mm	mm
45.000	45.000	45.000	45.000	45.000
90.000	90.000	90.000	90.000	90.000
135.000	135.000	135.000	135.000	135.000
180.000	180.000	180.000	180.000	180.000
225.000	225.000	225.000	225.000	225.000
270.000	270.000	270.000	270.000	270.000
315.000	315.000	315.000	315.000	315.000
360.000	360.000	360.000	360.000	360.000

**Remarks:**  
Calibration is only for use for the laboratory and environmental conditions during which the calibration took place.  
Direction of wind:  
Direction of flow calibration:  
Direction of flow calibration:  
Direction of flow calibration:

\*\*\*\*\*End of Certificate of Calibration\*\*\*\*\*

Page 1 of 2 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: [Blank]  
MODEL/TYPE: [Blank]  
SERIAL NUMBER: [Blank]  
CONDITION AS-RECEIVED: [Blank]  
CUSTOMER: [Blank]

**RECEIVED DATE**  
MEASUREMENT DATE: [Blank]  
ISSUE DATE: [Blank]

**ENVIRONMENTAL CONDITIONS:**  
Ambient condition in the laboratory are as follow:  
Temperature: 23.0 ± 0.2 °C  
Relative Humidity: 55.0 ± 0.5 %RH

**PLACE OF CALIBRATION**  
[Blank]

**CALIBRATION CONDITION**  
Wind tunnel cross section area: 300 cm²  
Wind direction (upstream): 120°  
Direction of measuring plane: 0°  
Blockage ratio of test object: 0.143

**Prescribing Measurement Condition**  
24 hours at different conditions.  
(The average value during measurement are 23.0 ± 0.2 °C, 55.0 ± 0.5 %RH and 1013.0 ± 0.3 hPa)

**TABULATION OF RESULTS**  
The table on next page give the measured values.

Calibrated by: [Signature]  
[Blank]  
[Blank]

Approved signature: [Signature]  
Mr. Parinya Booncharoen  
Calibration Department Manager

\*\*\*\*\*End of Certificate of Calibration\*\*\*\*\*

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CALIBRATION 0367

Temperature measurement laboratory  
Calibration services department

NAC-TIS-TIS 17025  
CALIBRATION 0367

Certificate No.: CDT-094-07

Page 1 of 2 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: Data Logger with Temperature sensor  
MODEL/TYPE: 220-W5-250R  
SERIAL NUMBER: 45283  
IS NUMBER: N/A  
CONDITION AS RECEIVED: Used item  
CUSTOMER: ALS Laboratory group (Thailand) Co., Ltd.  
104 Phatthanasak 40, Phatthanasak Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

**RECEIVED DATE**: 29 May 2024  
**MEASUREMENT DATE**: 10 Jun 2024  
**ISSUE DATE**: 10 Jun 2024

**ENVIRONMENTAL CONDITIONS**  
Ambient condition in the laboratory are as follows:  
Temperature: 23.0 ± 0.5 °C  
Relative Humidity: 55.0 ± 15.0 %RH

**NOTES**: The certificate is valid only for the item calibrated on date and place of calibration.

**TABULATION OF RESULTS**  
The table on next page give the measured values.

**Calibration by**  
☒ Mr. Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul

**Approved signature**  
Mr. Jiraporn Thachakul  
Calibration Department Manager

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Certificate of Calibration Number: CDT-094-07

Page 2 of 2 Pages

**Result of Calibration**: ☒ Without Adjustment ☐ With Adjustment

**Calibration Range**: 20 °C to 40 °C

**Function**: Temperature

**Table 1**: This equipment was connected with temperature sensor Model: HM1603 1/16" NPT/0.063, Dimension: Diameter 12 mm, Length 80 mm.

Immersion Depth (mm)	Standard Reading (°C)	Observed Reading (°C)	Error (°C)	Uncertainty (°C)
70	25.000	24.6	-0.5	0.009
70	25.003	24.6	-0.5	0.009
70	30.043	29.5	-0.5	0.009
70	35.083	34.4	-0.6	0.009
70	40.023	39.4	-0.6	0.009

**Uncertainty**: 0.009 °C

**Remarks**: The reported uncertainty of measurement is 0.009, based on standard uncertainty multiplied by a coverage factor k=2.25 providing a level of confidence of approximately 95%.

**\*\*End of Certificate of Calibration\*\***

**Calibration by**  
☒ Mr. Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul

**Approved signature**  
Mr. Jiraporn Thachakul  
Calibration Department Manager

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Certificate of Calibration Number: CDT-094-07

Page 1 of 2 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: Relative Humidity with data logger  
MODEL/TYPE: Data Logger 220-W5-250R  
SERIAL NUMBER: 45283  
IS NUMBER: N/A  
CONDITION AS RECEIVED: Used item  
CUSTOMER: ALS Laboratory group (Thailand) Co., Ltd.  
104 Phatthanasak 40, Phatthanasak Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

**RECEIVED DATE**: 29 May 2024  
**MEASUREMENT DATE**: 10 Jun 2024  
**ISSUE DATE**: 10 Jun 2024

**ENVIRONMENTAL CONDITIONS**  
Ambient condition in the laboratory are as follows:  
Temperature: 23.0 ± 0.5 °C  
Relative Humidity: 55.0 ± 15.0 %RH

**NOTES**: The certificate is valid only for the item calibrated on date and place of calibration.

**TABULATION OF RESULTS**  
The table on next page give the measured values.

**Calibration by**  
☒ Mr. Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul

**Approved signature**  
Mr. Jiraporn Thachakul  
Calibration Department Manager

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Certificate of Calibration Number: CDT-094-07

Page 2 of 2 Pages

**MEASUREMENT RESULTS**  
The results of calibration and associated measurement uncertainties are reported in the table below.

**Table 1**: The results of calibration of relative humidity at 10 °C are reported in table below.

Air Temperature (°C)	Standard Reading (°RH)	Observed Reading (°RH)	Error (°RH)	Uncertainty (°RH)
25.0	55.0	54.5	-0.5	0.01
25.0	55.0	54.5	-0.5	0.01
25.0	55.0	54.5	-0.5	0.01

**\*\*End of Certificate of Calibration\*\***

**Calibration by**  
☒ Mr. Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul

**Approved signature**  
Mr. Jiraporn Thachakul  
Calibration Department Manager

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Calibration services department

NAC-TIS-TIS 17025  
CALIBRATION 0367

Certificate of Calibration Number: CDT-094-07

Page 1 of 2 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: Cup anemometer  
MODEL/TYPE: Sensor: 45-001  
SERIAL NUMBER: Data Logger: 220-W5-250R  
IS NUMBER: N/A  
CONDITION AS RECEIVED: Used item  
CUSTOMER: ALS Laboratory group (Thailand) Co., Ltd.  
104 Phatthanasak 40, Phatthanasak Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

**RECEIVED DATE**: 29 May 2024  
**MEASUREMENT DATE**: 10 Jun 2024  
**ISSUE DATE**: 10 Jun 2024

**ENVIRONMENTAL CONDITIONS**  
Ambient condition in the laboratory are as follows:  
Temperature: 23.0 ± 0.5 °C  
Relative Humidity: 55.0 ± 15.0 %RH

**PLAC OF CALIBRATION**: Effect type wind tunnel of Iranatee Associates Co., Ltd.

**CALIBRATION CONDITIONS**  
Wind tunnel cross section area: 900 cm<sup>2</sup>  
Wind direction (up/down): 100 cm<sup>2</sup>  
Direction of rotating part: 100 cm<sup>2</sup>  
Measurement of flow speed: 0.111 m/s

**Preconditioning**  
Measurement Condition: 24 hours in ambient conditions.

**TABULATION OF RESULTS**  
The table on next page give the measured values.

**Calibration by**  
☒ Mr. Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul

**Approved signature**  
Mr. Jiraporn Thachakul  
Calibration Department Manager

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Calibration services department

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Certificate of Calibration Number: CDT-094-07

Page 2 of 2 Pages

**MEASUREMENT RESULTS**  
The results of calibration and associated measurement uncertainties are reported in the table below.

Air Temp. (°C)	Temp. Wind Tunnel (°C)	Temp. Hum. (°C)	Air Hum. (°RH)	Error (°RH)	Uncertainty (°RH)
25.0	25.0	25.0	55.0	-0.5	0.01
25.0	25.0	25.0	55.0	-0.5	0.01
25.0	25.0	25.0	55.0	-0.5	0.01

**\*\*End of Certificate of Calibration\*\***

**Calibration by**  
☒ Mr. Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul

**Approved signature**  
Mr. Jiraporn Thachakul  
Calibration Department Manager

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Calibration services department

NAC-TIS-TIS 17025  
CALIBRATION 0367

Certificate of Calibration Number: CDT-094-07

Page 1 of 2 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: Wind direction sensor  
MODEL/TYPE: Sensor: 45-001  
SERIAL NUMBER: Data Logger: 220-W5-250R  
IS NUMBER: N/A  
CONDITION AS RECEIVED: Used item  
CUSTOMER: ALS Laboratory group (Thailand) Co., Ltd.  
104 Phatthanasak 40, Phatthanasak Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

**RECEIVED DATE**: 29 May 2024  
**MEASUREMENT DATE**: 10 Jun 2024  
**ISSUE DATE**: 10 Jun 2024

**ENVIRONMENTAL CONDITIONS**  
Ambient condition in the laboratory are as follows:  
Temperature: 23.0 ± 0.5 °C  
Relative Humidity: 55.0 ± 15.0 %RH

**PLAC OF CALIBRATION**: Effect type wind tunnel of Iranatee Associates Co., Ltd.

**CALIBRATION CONDITIONS**  
Wind tunnel cross section area: 900 cm<sup>2</sup>  
Wind direction (up/down): 100 cm<sup>2</sup>  
Direction of rotating part: 100 cm<sup>2</sup>  
Measurement of flow speed: 0.111 m/s

**Preconditioning**  
Measurement Condition: 24 hours in ambient conditions.

**TABULATION OF RESULTS**  
The table on next page give the measured values.

**Calibration by**  
☒ Mr. Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul

**Approved signature**  
Mr. Jiraporn Thachakul  
Calibration Department Manager

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NAC-TIS-TIS 17025  
CALIBRATION 0367

Certificate of Calibration Number: CDT-094-07

Page 2 of 2 Pages

**MEASUREMENT RESULTS**  
The results of calibration and associated measurement uncertainties are reported in the table below.

Air speed (m/s)	°C (°F)	°C (°F)	Error (°C)	Uncertainty (°C)
45.000	41	41	0	0.00
50.000	42	42	0	0.00
55.000	43	43	0	0.00
60.000	44	44	0	0.00
65.000	45	45	0	0.00
70.000	46	46	0	0.00
75.000	47	47	0	0.00
80.000	48	48	0	0.00

**\*\*End of Certificate of Calibration\*\***

**Calibration by**  
☒ Mr. Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul

**Approved signature**  
Mr. Jiraporn Thachakul  
Calibration Department Manager

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Temperature measurement laboratory  
Calibration services department

NAC-TIS-TIS 17025  
CALIBRATION 0367

Certificate of Calibration Number: CDT-094-07

Page 1 of 2 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: Cup anemometer  
MODEL/TYPE: Sensor: 45-001  
SERIAL NUMBER: Data Logger: 220-W5-250R  
IS NUMBER: N/A  
CONDITION AS RECEIVED: Used item  
CUSTOMER: ALS Laboratory group (Thailand) Co., Ltd.  
104 Phatthanasak 40, Phatthanasak Rd., Khwaeng Suan Luang, Khet Suan Luang, Bangkok 10250 Thailand.

**RECEIVED DATE**: 29 May 2024  
**MEASUREMENT DATE**: 10 Jun 2024  
**ISSUE DATE**: 10 Jun 2024

**ENVIRONMENTAL CONDITIONS**  
Ambient condition in the laboratory are as follows:  
Temperature: 23.0 ± 0.5 °C  
Relative Humidity: 55.0 ± 15.0 %RH

**PLAC OF CALIBRATION**: Effect type wind tunnel of Iranatee Associates Co., Ltd.

**CALIBRATION CONDITIONS**  
Wind tunnel cross section area: 900 cm<sup>2</sup>  
Wind direction (up/down): 100 cm<sup>2</sup>  
Direction of rotating part: 100 cm<sup>2</sup>  
Measurement of flow speed: 0.111 m/s

**Preconditioning**  
Measurement Condition: 24 hours in ambient conditions.

**TABULATION OF RESULTS**  
The table on next page give the measured values.

**Calibration by**  
☒ Mr. Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul  
☒ Miss Jiraporn Thachakul

**Approved signature**  
Mr. Jiraporn Thachakul  
Calibration Department Manager

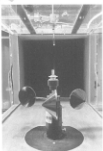
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Certificate Number					
CWS-054-07					
Page 2 of 2 Pages					
MEASUREMENT RESULTS <sup>1</sup>					
The Cup anemometer, Unit Under Calibration (UUC) was examined at 10 m/s for 1 minutes prior to calibration being performed. The standard air velocity 10 m/s to 1 m/s was calculated by a standard air velocity transducer which was installed 50 mm away from wind tunnel nozzle and installed 40 mm away from the top of the test section and the standard air velocity 5 m/s to 10 m/s was calculated by a pitot tube with precision differential pressure sensor which was installed 50 mm away from axial tunnel nozzle and installed 40 mm away from top of the test section. UUC was mounted on a rigid vertical rod of the lower plate at center of test section. The calibration was carried out under both static and dynamic air velocity in the range of 1 m/s to 10 m/s at calibration interval of 1 m/s. The results of calibration and associated measurement uncertainties are reported in the table below.					
UUC <sup>2</sup> (m/s)	Temp. wind tunnel (°C)	Temp. room (°C)	UUC <sup>2</sup> (m/s)	Error (m/s)	U <sub>95</sub> (%)
1.00	24.10	24.20	0.7	-0.3	0.35
2.00	24.30	24.30	1.7	-0.3	0.35
3.00	24.30	24.30	2.8	-0.2	0.35
4.00	24.20	24.30	3.7	-0.3	0.35
5.00	24.20	24.30	4.8	-0.2	0.35
6.00	24.20	24.30	5.9	-0.1	0.35
7.00	24.20	24.30	7.0	0.0	0.35
8.00	24.10	24.30	8.0	0.0	0.35
9.00	24.10	24.30	9.0	0.1	0.35
10.00	24.10	24.30	10.0	0.1	0.35
11.00	24.10	24.30	11.0	0.1	0.35
12.00	24.10	24.30	12.0	0.1	0.35
13.00	24.10	24.30	13.0	0.1	0.35
14.00	24.10	24.30	14.0	0.1	0.35
15.00	24.10	24.30	15.0	0.1	0.35
16.00	24.10	24.30	16.0	0.1	0.35

Remarks:  
<sup>1</sup> Calibration results only valid for the stated circumstances and environmental conditions during which calibration took place  
<sup>2</sup> Velocity of wind  
<sup>3</sup> Velocity of wind

PHOTO OF CALIBRATION SET-UP



Calibration set-up of the Cup anemometer calibration in the wind tunnel of Jiranatee Associates Co., Ltd. The Cup anemometer shown may differ from the calibrated one. Remarks: The properties of the set-up is not true to scale due to imaging geometry.



JIRANATEE ASSOCIATES CO., LTD.

Accredited calibration laboratory  
ISO/IEC 17025:2017  
ACC-101-19-2025  
CALIBRATION 0367

Temperature measurement laboratory  
Calibration services department.

NAC-TSI - TS 17025  
CALIBRATION 0367

## CERTIFICATE OF CALIBRATION

Certificate No.: COT-087-07 Page 1 of 2 Pages

**MEASUREMENT ITEM**  
 MANUFACTURER: (None)  
 MODEL/TYPE: 110-W5-200-0  
 SERIAL NUMBER: 15508  
 ID NUMBER: 18K, F12123  
 CONDITION AS RECEIVED: Used item  
 CUSTOMER: A/S Laboratory group (Thailand) Co., Ltd.  
 104 Phatthanaburi 40, Phatthanaburi Rd.,  
 Khwaeng Suan Luang, Khwaeng Suan Luang,  
 Bangkok 10250 Thailand.

**RECEIVED DATE**: 17 May 2024  
**MEASUREMENT DATE**: 21 May 2024  
**ISSUE DATE**: 21 May 2024

**ENVIRONMENTAL CONDITIONS:**  
 Ambient condition in the laboratory are as follow:  
 Temperature: 23.0 ± 0.5 °C  
 Relative humidity: 15.0 ± 15.0 %

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.



Approved signature: Mr. Parinya Boonchuan  
 Calibration Department Manager

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

JIRANATEE ASSOCIATES CO., LTD.

Accredited calibration laboratory  
ISO/IEC 17025:2017  
ACC-101-19-2025  
CALIBRATION 0367

Wind direction measurement laboratory  
Calibration services department.

NAC-TSI - TS 17025  
CALIBRATION 0367

## CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

**MEASUREMENT ITEM**  
 MANUFACTURER: (None)  
 MODEL/TYPE: Sensor W5-422  
 SERIAL NUMBER: Data Logger 110-W5-200-0  
 ID NUMBER: Sensor W5-422  
 CONDITION AS RECEIVED: Used item  
 CUSTOMER: A/S Laboratory group (Thailand) Co., Ltd.  
 104 Phatthanaburi 40, Phatthanaburi Rd., Khwaeng Suan Luang, Khwaeng Suan Luang,  
 Bangkok 10250 Thailand.

**RECEIVED DATE**: 17 May 2024  
**MEASUREMENT DATE**: 21 May 2024  
**ISSUE DATE**: 21 May 2024

**ENVIRONMENTAL CONDITIONS:**  
 Ambient condition in the laboratory are as follow:  
 Temperature: 23.0 ± 0.5 °C  
 Relative humidity: 15.0 ± 15.0 %  
 Atmospheric Pressure: 1013.25 hPa

**PLACE OF CALIBRATION**: Effect type wind tunnel of Jiranatee Associates Co., Ltd.

**CALIBRATION CONDITIONS**  
 Wind tunnel cross-section area: 900 m<sup>2</sup>  
 Wind direction (up/down): 120 mm  
 Diameter of rotating part: 120 mm  
 Measurement of UUC effect: 0.143

**Preconditioning**  
 Measurement Condition: 24 hours at ambient condition.  
 The average value during measurement are 103.7°C, 140.81 N/m and 1000.7 hPa.

**TABULATION OF RESULTS:**  
 The table on next page give the measured values.

Calibrated by: (None)  
 Checked by: (None)  
 Approved signature: Mr. Parinya Boonchuan  
 Calibration Department Manager

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

JIRANATEE ASSOCIATES CO., LTD.

Accredited calibration laboratory  
ISO/IEC 17025:2017  
ACC-101-19-2025  
CALIBRATION 0367

Relative humidity and air temperature measurement laboratory  
Calibration services department.

NAC-TSI - TS 17025  
CALIBRATION 0367

## CERTIFICATE OF CALIBRATION

Page 2 of 2 Pages

**MEASUREMENT RESULTS<sup>1</sup>**  
 The wind direction sensor was calibrated against standard rotary vane by comparison method. During calibration, the measurement was carried out at 45° intervals in clockwise and counter-clockwise directions after adjustment has been made. The flow speed of wind tunnel (usually 5 m/s) is not constant while the sensor is rotated around in vertical axis. The results of calibration and associated measurement uncertainties are reported in the table below.

Remarks:				
* Calibration results only count for the listed circumstances and environmental conditions during which calibration took place				
* Direction of standard				
* Direction of Unit Under Calibration				

Page 1 of 3 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: J NAC  
MODEL/TYPE: JNAC-105-15-17025  
SERIAL NUMBER: 1517025  
ID NUMBER: 1517025  
CONDITION AS RECEIVED: OK

**RECEIVED DATE:** 18 Dec 2024  
**ISSUE DATE:** 19 Dec 2024

**ENVIRONMENTAL CONDITIONS:**  
Ambient conditions in the laboratory are as follows:  
Temperature: 23.0 ± 1.0 °C  
Relative Humidity: 50 ± 5 %  
Air Pressure: 1013 ± 5 hPa

**PLACE OF CALIBRATION:** J NAC Calibration Laboratory, 105-15-17025

**CALIBRATION CONDITION:** 105-15-17025

**Preconditioning:** 24 hours at ambient conditions.

**TABULATION OF RESULTS:** The table on next page gives the measured values.

Calibrated by: J NAC  
Approved by: J NAC

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Page 2 of 3 Pages

**MEASUREMENT RESULT 1)**

As found	As found	As found	As found	As found
mm	mm	mm	mm	mm
0.02	0.02	0.02	0.02	0.02

**Remarks:** 1) The calibration is valid only for the item calibrated on date and place of calibration.

Calibrated by: J NAC  
Approved by: J NAC

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Page 1 of 3 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: J NAC  
MODEL/TYPE: JNAC-105-15-17025  
SERIAL NUMBER: 1517025  
ID NUMBER: 1517025  
CONDITION AS RECEIVED: OK

**RECEIVED DATE:** 18 Dec 2024  
**ISSUE DATE:** 19 Dec 2024

**ENVIRONMENTAL CONDITIONS:**  
Ambient conditions in the laboratory are as follows:  
Temperature: 23.0 ± 1.0 °C  
Relative Humidity: 50 ± 5 %

**TABULATION OF RESULTS:** The table on next page gives the measured values.

Calibrated by: J NAC  
Approved by: J NAC

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Page 2 of 3 Pages

**MEASUREMENT RESULT 1)**

As found	As found	As found	As found	As found
mm	mm	mm	mm	mm
0.02	0.02	0.02	0.02	0.02

**Remarks:** 1) The calibration is valid only for the item calibrated on date and place of calibration.

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Approved by: J NAC

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Page 1 of 3 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: J NAC  
MODEL/TYPE: JNAC-105-15-17025  
SERIAL NUMBER: 1517025  
ID NUMBER: 1517025  
CONDITION AS RECEIVED: OK

**RECEIVED DATE:** 18 Dec 2024  
**ISSUE DATE:** 19 Dec 2024

**ENVIRONMENTAL CONDITIONS:**  
Ambient conditions in the laboratory are as follows:  
Temperature: 23.0 ± 1.0 °C  
Relative Humidity: 50 ± 5 %

**TABULATION OF RESULTS:** The table on next page gives the measured values.

Calibrated by: J NAC  
Approved by: J NAC

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Page 2 of 3 Pages

**MEASUREMENT RESULT 1)**

As found	As found	As found	As found	As found
mm	mm	mm	mm	mm
0.02	0.02	0.02	0.02	0.02

**Remarks:** 1) The calibration is valid only for the item calibrated on date and place of calibration.

Calibrated by: J NAC  
Approved by: J NAC

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Page 3 of 3 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: J NAC  
MODEL/TYPE: JNAC-105-15-17025  
SERIAL NUMBER: 1517025  
ID NUMBER: 1517025  
CONDITION AS RECEIVED: OK

**RECEIVED DATE:** 18 Dec 2024  
**ISSUE DATE:** 19 Dec 2024

**ENVIRONMENTAL CONDITIONS:**  
Ambient conditions in the laboratory are as follows:  
Temperature: 23.0 ± 1.0 °C  
Relative Humidity: 50 ± 5 %

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Page 1 of 3 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: J NAC  
MODEL/TYPE: JNAC-105-15-17025  
SERIAL NUMBER: 1517025  
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CONDITION AS RECEIVED: OK

**RECEIVED DATE:** 18 Dec 2024  
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**ENVIRONMENTAL CONDITIONS:**  
Ambient conditions in the laboratory are as follows:  
Temperature: 23.0 ± 1.0 °C  
Relative Humidity: 50 ± 5 %

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Page 1 of 3 Pages

**MEASUREMENT ITEM**  
MANUFACTURER: J NAC  
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CONDITION AS RECEIVED: OK

**RECEIVED DATE:** 18 Dec 2024  
**ISSUE DATE:** 19 Dec 2024

**ENVIRONMENTAL CONDITIONS:**  
Ambient conditions in the laboratory are as follows:  
Temperature: 23.0 ± 1.0 °C  
Relative Humidity: 50 ± 5 %

**TABULATION OF RESULTS:** The table on next page gives the measured values.

Calibrated by: J NAC  
Approved by: J NAC

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Calibration Procedure : CP-AC-01

Cert. No. : ACC25033  
Job No. : VC08AC0144  
Pages : 2 of 3

## Calibration Method :

This equipment was calibrated by follow 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	MY53202742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY5320104	BEL_BP 24/0258	22-APR-26
Digital Multimeter	33461A	MY5320076	BEL_BP 23/0268	22-APR-26
Digital Multimeter	33461A	MY60024273	CA2025 100EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100134	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26
Audio Analyzer	AVR-3360A	V744B0609	EF-0013-25	13-FEB-26

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 :

- 1.1 National Institute of Metrology (Thailand).
- 1.2 Thailand Institute of Scientific and Technological Research (TISTR).
- 1.3 Electrical And Electronics Institute (EEI).

## Result of calibration :

## 1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	94.20	0.20	0.14	0.40

## 2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1001.7	0.2	0.1	1.0

## 3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
1.53	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

Cert. No. : ACC25033  
Job No. : VC08AC0144  
Pages : 3 of 3

## Certificate of Calibration

## Customer

Name : ALS Laboratory Group Thailand Co., Ltd.  
Address : 104 Suk Phatthanamon 40, Phatthanamon Road, Suan Luang, Bangkok 10250Certificate No. : 25-SLM-148  
Request No. : Req-2025-4773

## Unit Under Calibration Details

Measurement Item : Sound Level Meter  
Manufacturer : EIDN  
Model : NL-42  
Serial Number : 00807053  
ID : EDC 130908  
Resolution : 0.1 dBMeasurement Class : 2  
Microphone Model : UC-02  
Microphone SN : 179112  
Pre-amplifier Model : NIS-24  
Pre-amplifier SN : 73529  
Instrument Status : Used


## Calibration Environment and Details

Temperature : 23 °C ± 2 °C  
Humidity : 50 % RH ± 20 % RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 29 March 2025  
Calibrated Date : 28 April 2025  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-1:2013 Electromagnetic - Sound level meters - Part 1: Portable units  
Location of Calibration : Lab A-0001

## Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	Briel-Kjaer	4192	2294985	23 June 2025	NIST
Audio Generator	Sonytek	Ssona01	131	15 October 2025	UK Etsi

## Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor  $k = 2$ , providing a level of confidence approximately 95 %.Calibrated By :   
Mr. Nopphon Luangnam  
Service Calibration EngineerApproved By :   
Mr. Paet Malaisri  
Calibration Engineer Supervisor  
Issue Date : 28 April 2025This result related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuance Instrument Co., Ltd.  
[06-7045-0040] Rev:00 Issue Date: 17/07/25

## 1. Indication at the calibration check frequency

UUC Setting	Nominal  Level  (dB)	Before Adjust		After Adjust		UNCERTAINTY   ( ± dB)
FAST / A / 30-130		UUC	ERR	UUC	ERR	
Calibrator Setting		(dB)	(dB)	(dB)	(dB)	
1000 Hz 94 dB	93.77	93.5	-0.27	93.8	0.03	0.20

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand Svanick, Model SV35A, SN. 58079

## 2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	60dB	(± dB)
A	14.9	0.10

## 3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	60dB	(± dB)
A	11.5	0.20
C	15.9	0.30
Z	18.9	0.30

## 4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY
FAST / 30-130	A	C	Z	(± dB)
STD Setting	(dB)	(dB)	(dB)	
125 Hz	0.5	0.7	0.7	0.60
1000 Hz	0.0	0.0	0.0	0.60
4000 Hz	-1.4	-1.4	-1.5	0.60
8000 Hz	-3.1	-3.0	-2.9	0.70

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuance Instrument Co., Ltd.  
[06-7045-0040] Rev:00 Issue Date: 17/07/25

## 5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY
FAST /30-130	A (dB)	C (dB)	Z (dB)	
STD Setting				( ± dB)
63 Hz	-0.3	-0.2	-0.1	0.20
125 Hz	-0.2	0.0	-0.1	
250 Hz	-0.1	-0.1	-0.1	
500 Hz	-0.1	0.0	0.0	
1000 Hz	0.0	0.0	0.0	
2000 Hz	0.0	0.0	0.0	
4000 Hz	0.0	0.0	0.0	
8000 Hz	0.0	0.0	0.0	
16000 Hz	-1.4	-1.4	0.0	

## 6. Frequency and time weightings at 1kHz

UUC Setting	REF	UUC	ERR	UNCERTAINTY
FAST / 30-130				
UUC Weighting	60dB	60dB	60dB	(± dB)
A	114.00	114.0	0.0	0.20
C	114.00	114.0	0.0	
Z	114.00	114.0	0.0	

UUC Setting	STD	Measured		UNCERTAINTY
30-130 / A	REF	UUC	ERR	
UUC Time Response	(dB)	(dB)	(dB)	
Fast	114.00	114.0	0.0	± 0.20
Slow	114.00	114.0	0.0	
Log	114.00	114.0	0.0	

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuance Instrument Co., Ltd.  
[06-7045-0040] Rev:00 Issue Date: 17/07/25

## 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY
FAST / A / 30-130	UUC	
STD Setting	60dB	(± dB)
Initial	114.0	
Final	114.0	
Deviation	0.0	0.10

## 8. Level linearity on the reference level range

UUC Setting	Antiquated	REF	UUC	ERR	UNCERTAINTY
FAST / A / 30-130					
STD dB	60dB	60dB	60dB	60dB	(± dB)
120.00	120	120.0	0.0		
124.00	124	124.0	0.0		
128.00	128	128.0	0.0		
132.00	132	132.0	0.0		
136.00	136	136.0	0.0		
140.00	140	140.0	0.0		
144.00	144	144.0	0.0		
148.00	148	148.0	0.0		
152.00	152	152.0	0.0		
156.00	156	156.0	0.0		
160.00	160	160.0	0.0		
164.00	164	164.0	0.0		
168.00	168	168.0	0.0		
172.00	172	172.0	0.0		
176.00	176	176.0	0.0		
180.00	180	180.0	0.0		
184.00	184	184.0	0.0		
188.00	188	188.0	0.0		
192.00	192	192.0	0.0		
196.00	196	196.0	0.0		
200.00	200	200.0	0.0		
204.00	204	204.0	0.0		
208.00	208	208.0	0.0		
212.00	212	212.0	0.0		
216.00	216	216.0	0.0		
220.00	220	220.0	0.0		
224.00	224	224.0	0.0		
228.00	228	228.0	0.0		
232.00	232	232.0	0.0		
236.00	236	236.0	0.0		
240.00	240	240.0	0.0		

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuance Instrument Co., Ltd.  
[06-7045-0040] Rev:00 Issue Date: 17/07/25

## 9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY
FAST / A		UUC	ERR	
UUC Range		(dB)	(dB)	
001.00	20.50	20.6	0.1	0.30
	114	114.0	0.0	

## 10. Tone burst response

UUC Setting	STD	Antiquated	Measured		UNCERTAINTY
A / 30-130	Touchscreen	Ref	UUC	ERR	
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)
Fast	200	126.0	126.0	0.0	0.20
	2	109.0	108.9	-0.1	
	0.25	100.0	99.9	-0.1	
Slow	200	119.6	119.5	-0.1	
	2	100.0	99.9	-0.1	
	0.25	100.0	100.0	0.0	
SEL	200	120.0	120.0	0.0	
	0.25	91.0	90.8	-0.2	

## 11. Peak C sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY
FAST / C / 35-141	REF	UUC	ERR	
STD Setting	(dB)	(dB)	(dB)	
				( ± dB)
Complete cycle	136.4	136.3	-0.10	0.20
Positive half cycle	135.4	135.1	-0.30	
Negative half cycle	135.4	135.1	-0.30	

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuance Instrument Co., Ltd.  
[06-7045-0040] Rev:00 Issue Date: 17/07/25The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuance Instrument Co., Ltd.  
[06-7045-0040] Rev:00 Issue Date: 17/07/25The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuance Instrument Co., Ltd.  
[06-7045-0040] Rev:00 Issue Date: 17/07/25

Certificate No. : 25-58147  
Request No. : Req-2025-6772

#### 1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY
		Level	UUC	ERR	UUC	ERR
FAST / A / 30-130			(dB)	(dB)	(dB)	(dB)
UUC Setting	(dB)					(± dB)
1000 Hz 94 dB	93.77	94.1	0.33	93.8	93.5	0.30

Note: Absolute sensitivity was established by the use of Sontec Calibrator (Brod Strunk, Model SV15A, SN: 5079)

#### 2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	15.7	0.10

#### 3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	12.4	0.10
C	16.3	0.10
Z	20.4	0.10

#### 4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency			UNCERTAINTY
	Weighting Response curve			
	A	C	Z	
FAST / 30-130				(± dB)
STD Setting	(dB)	(dB)	(dB)	
125 Hz	0.2	0.4	0.4	0.60
1000 Hz	0.0	0.0	0.0	0.60
4000 Hz	0.0	0.1	0.0	0.60
8000 Hz	-1.3	-1.4	-1.4	0.70

The results related only to the item calibrated. The certificate shall not be reproduced except by full written written approval of the Innovations Instrument Co., Ltd.

ISO 17025:2017 Rev.01 Issue Date: 1/2/25

Certificate No. : 25-58147  
Request No. : Req-2025-6772

#### 5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting		Deviation from various Frequencies			UNCERTAINTY
FAST / 30-130	STD Setting	A (dB)	C (dB)	Z (dB)	
	125 Hz	-0.1	0.0	0.0	0.20
	125 Hz	-0.1	-0.1	0.0	
	250 Hz	0.0	-0.0	0.0	
	500 Hz	0.0	0.1	0.1	
	1000 Hz	0.0	0.0	0.1	
	2000 Hz	0.1	0.1	0.1	
	4000 Hz	0.0	0.1	0.1	
	8000 Hz	0.1	0.1	0.1	
	16000 Hz	-1.3	-1.3	0.1	

#### 6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY
		UUC	ERR	
FAST / 30-130				(± dB)
UUC Weighting	(dB)	(dB)	(dB)	(± dB)
A	114.00	114.0	0.0	0.20
C	114.00	114.0	0.0	0.20
Z	114.00	114.0	0.0	0.20

UUC Setting	STD	Measured		UNCERTAINTY
		UUC	ERR	
30-130 / A				(± dB)
UUC Time Response	(dB)	(dB)	(dB)	(± dB)
Fast	114.00	114.0	0.0	0.20
Slow	114.00	114.0	0.0	0.20
Long	114.00	114.0	0.0	0.20

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ISO 17025:2017 Rev.01 Issue Date: 1/2/25

Certificate No. : 25-58147  
Request No. : Req-2025-6772

#### 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY
FAST / A / 30-130		
UUC Setting	(dB)	(± dB)
Initial	114.0	
Final	114.0	
Deviation	0.0	0.40

#### 8. Level linearity on the reference level range

UUC Setting	Deviation			UNCERTAINTY
	REF	UUC	ERR	
FAST / 30-130	(dB)	(dB)	(dB)	(± dB)
STD dB	(dB)	(dB)	(dB)	(± dB)
138.00	138	138.0	0.0	
134.00	134	134.0	0.0	
129.00	129	129.0	0.0	
124.00	124	124.0	0.0	
119.00	119	119.0	0.0	
114.00	114	114.0	0.0	
109.00	109	109.0	0.0	
104.00	104	104.0	0.0	
99.00	99	99.0	0.0	
94.00	94	94.0	0.0	
89.00	89	89.0	0.0	
84.00	84	84.0	0.0	
79.00	79	79.0	0.0	
74.00	74	74.0	0.0	
69.00	69	69.0	0.0	
64.00	64	64.0	0.0	
59.00	59	59.0	0.0	
54.00	54	54.0	0.0	
49.00	49	49.0	0.0	
44.00	44	44.0	0.0	
39.00	39	39.1	0.1	
34.00	34	34.1	0.1	
29.00	29	29.1	0.1	
24.00	24	24.0	0.0	

The results related only to the item calibrated. The certificate shall not be reproduced except by full written written approval of the Innovations Instrument Co., Ltd.

ISO 17025:2017 Rev.01 Issue Date: 1/2/25

Certificate No. : 25-58147  
Request No. : Req-2025-6772

#### 9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY
		REF	UUC	
FAST / A				(± dB)
UUC Range	(dB)	(dB)	(dB)	(± dB)
30-130	29.50	29.6	0.1	0.30
	114	114.0	0.0	

#### 10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY
			REF	UUC	
A / 30-130					(± dB)
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)
Fast	200	126.0	126.1	-0.1	
	2	109.0	109.0	0.0	
	0.25	108.0	108.0	-0.1	
Slow	200	119.6	119.6	0.0	
	2	108.0	108.0	0.0	
	200	120.0	120.0	0.0	
SIL	2	108.0	108.0	0.0	
	0.25	91.0	90.9	-0.1	

#### 11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY
		REF	UUC	
FAST / C / 15-141				(± dB)
STD Setting	(dB)	(dB)	(dB)	(± dB)
Complete cycle	135.4	135.8	-0.40	
Positive half cycle	135.4	135.2	-0.20	
Negative half cycle	135.4	135.2	-0.20	

The results related only to the item calibrated. The certificate shall not be reproduced except by full written written approval of the Innovations Instrument Co., Ltd.

ISO 17025:2017 Rev.01 Issue Date: 1/2/25

Certificate No. : 25-58147  
Request No. : Req-2025-6772

#### 12. Overload indication

UUC Setting	Measured	UNCERTAINTY
FAST / A / 30-130		
STD Setting	(dB)	(± dB)
Positive over-half cycle	139.3	
Negative over-half cycle	139.3	
Deviation	-0.2	0.20

#### 13. High Level Stability

UUC Setting	Measured	UNCERTAINTY
FAST / A / 30-130		
STD Setting	(dB)	(± dB)
Initial	129.0	
Final	129.0	
Deviation	0.0	0.20

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except by full written written approval of the Innovations Instrument Co., Ltd.

ISO 17025:2017 Rev.01 Issue Date: 1/2/25

### SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

401-403/1 Sathorn Road, Bangkok, Bangkok, 10120 Thailand  
Tel: +66 2433 8328 Email: calibration@sithiporn.com

Cert. No. : ACL24344  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NC-42 / Microphone UC-51 / Pre-amplifier NF-24  
Serial No. : 00297156 / 170403 / 72904  
ID No. : BUCE\_F50894

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHWAENG PHATTANAKAN, KHUET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %  
Received Date : 01 NOVEMBER 2024  
Calibration Date : 12 NOVEMBER 2024  
Date of Issue : 13 NOVEMBER 2024

REVIEW BY : *Prasanna P.*  
APPROVED BY : *[Signature]*  
NEXT CAL DATE : 12/11/25

Calibrated by : Sathakorn Prasanna

Approved by : *T. Petch*  
( Thanakul Petchum )

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.

### SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

401-403/1 Sathorn Road, Bangkok, Bangkok, 10120 Thailand  
Tel: +66 2433 8328 Email: calibration@sithiporn.com

Cert. No. : ACL24344  
Job No. : VC08AC0027  
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 been to Acoustical and Electrical signal size of frequency weighting with A-weighting and Reference  
Standard Instruments.  
For tests results of each item 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	33710A	MY40017076	IF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY5220104	SEL-BP-210267	13-FEB-25
Digital Multimeter	33461A	MY51220076	SEL-BP-200267	15-FEB-25
Digital Multimeter	34461A	MY60024273	SEL-BP-200567	15-FEB-25
Programmable Attenuator	MAT-1670	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	74560495	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 available to the international system of unit maintained at :

- 1.1 National Institute of Metrology (Thailand).
- 1.2 Thai Institute of Scientific and Technological Research (TISTR).

### SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

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Tel: +66 2433 8328 Email: calibration@sithiporn.com

Cert. No. : ACL24344  
Job No. : VC08AC0027  
Pages : 3 of 8

#### Summary of Measurement Result :

Parameter	Uncertainty	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

#### 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)
13.8

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

Frequency	Weighting	Weighting (dB)
A-weight		9.9
C-weight		16.0
Flat		21.9

##### 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB				
Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.7	0.7	0.8	±1.5
1000	0.1	0.1	0.1	±1.0
8000	-1.8	-1.8	-1.7	±5.0

*T. Petch*

*T. Petch*

*T. Petch*



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Cert. No. : ACL24344  
Job No. : VCMAC0027  
Pages : 5 of 8

**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	0.0	-0.1	-0.1	±2.0
125	-0.1	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±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	94.0	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

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Cert. No. : ACL24344  
Job No. : VCMAC0027  
Pages : 5 of 8

**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
29.0	29.0	0.0	±1.1
24.0	24.0	0.0	±1.1
19.0	19.0	0.0	±1.1
14.0	14.0	0.0	±1.1
9.0	9.0	0.0	±1.1

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Cert. No. : ACL24344  
Job No. : VCMAC0027  
Pages : 7 of 8

**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

**9. Time burst response**

Time Weighting	Time 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. : ACL24344  
Job No. : VCMAC0027  
Pages : 8 of 8

**16. Peak C sound level**

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	±3.0
One	133.4	133.4	0.0	±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	135.2	-0.2	±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	89.5	±1.5
Negative half cycle	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	±0.3

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

End of Calibration Certificate

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

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Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24345  
Pages : 1 of 8

**Calibration Certificate**

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / (Preamplifier) NF-24  
Serial No. : 0099159 / 180402 / 88172  
ID No. : BKCE\_F50595

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHAENG PHATTANAKAN, KHAENG SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 1 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 3 ) %

Received Date : 01 NOVEMBER 2024  
Calibration Date : 12 NOVEMBER 2024  
Date of Issue : 13 NOVEMBER 2024

Calibrated by :

Nakakura Pichaporn

Approved by :

T. Petchu  
( Thanakul Petchu )

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 LABORATORY**

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Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24345  
Job No. : VCMAC0027  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

**Calibration Method :**

This equipment was calibrated by follow on IEC-61672-1 (2013) Standard for sound level meter (SLM). The SLM had been tested to Acoustical and Electrical signal tests of frequency weighting with anechoic chamber and Reference Standard Instruments.

For test results of each item were made by observation of each instrument's 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-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY5320104	EEL-RP-210267	13-FEB-25
Digital Multimeter	33461A	MY5320076	EEL-RP-200267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-RP-220267	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-42KAJ	3450495	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 :

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

Cert. No. : ACL24045  
Job No. : VCMRAC0827  
Pages : 6 of 8

#### 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	132.9	-0.1	+1.1
132.0	131.9	-0.1	+1.1
131.0	130.9	-0.1	+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	28.0	0.0	+1.1
27.0	27.1	0.1	+1.1
26.0	26.2	0.2	+1.1
25.0	25.1	0.1	+1.1

#### 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.1	0.1	+1.1

#### 9. Tone burst response

Time Weighting	Tone burst duration, T <sub>b</sub> (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
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, Leq <sub>10</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	+3.0
On	133.4	133.4	0.0	+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		
89.5	89.5	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

Cert. No. : ACC20856  
Pages : 1 of 3

### Calibration Certificate

Equipment : SOUND CALIBRATOR  
Manufacturer : RION  
Model : NC-74  
Serial No. : 34423566  
ID No. : BKC\_F30617

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KIWAENG PHATTANAKAN, KHET SUAN LUANG,  
DANGKONG, 10259 THAILAND.

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

Received Date : 04 OCTOBER 2024  
Calibration Date : 22 OCTOBER 2024  
Date of Issue : 24 OCTOBER 2024

Calibrated by : Nishakorn Pitsuppan

Approved by : *T. Petch*  
( Thasakul Petchusit )

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.

#### Calibration Procedure : CP-AC-03

#### Calibration Method :

This equipment was calibrated by follow 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-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/0267	15-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/0267	15-FEB-25
Digital Multimeter	33461A	MY60024273	EEL-BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1002-24	12-FEB-25
Measuring Amplifier	NA-42KA1	34560495	AA-3001-24	05-FEB-25
Audio Analyzer	AVR-3360A	V74480609	EF-0009-24	09-FEB-25

2. This result of calibration was found accurate to 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).

#### Result of calibration :

##### 1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	94.14	0.14	0.14	0.40

##### 2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1001.9	0.2	0.1	1.0

##### 3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
1.12	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

Cert. No. : ACL25243  
Pages : 1 of 8

### Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NR-02 / Microphone UC-52 / Pre-amplifier NH-24  
Serial No. : 00710618 / 156056 / 10618  
ID No. : BKC\_FS0022

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KIWAENG PHATTANAKAN, KHET SUAN LUANG,  
DANGKONG, 10259 THAILAND.

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

Received Date : 06 JUNE 2025  
Calibration Date : 17 JUNE 2025  
Date of Issue : 18 JUNE 2025

Calibrated by : Nishakorn Pitsuppan

Approved by : *Wichok Ekongpradit*  
( Wichok Ekongpradit )

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. : ACL25243  
Job No. : VCMRAC0118  
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 in Acoustical and Electrical signal test of frequency weighting with Acoustic 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY52302742	EF-0012-25	11-FEB-26
Signal Multimeter	33461A	MY53220104	EEL-BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL-BP 23/0268	22-APR-26
Digital Multimeter	33461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KA1	34560495	AA-3002-25	19-FEB-26

2. This result of calibration was found accurate to 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).
- 3.3 Electrical And Electronics Institute (E3I).

#### 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



Cert. No. : ACL25243  
Job No. : VCBAC0118  
Page : 4 of 8

## Result of calibration :

## 1. Absolute sensitivity

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

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
17.2

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

Frequency Weighting (dB)	Weighting (dB)
A-weight	12.0
C-weight	18.2
Flat	23.6

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits (dB)
125	0.1	0.1	0.1	±1.5
1000	0.0	0.0	0.0	±1.0
8000	1.2	1.2	1.3	±5.0

Cert. No. : ACL25243  
Job No. : VCBAC0118  
Page : 5 of 8

## 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	-0.2	-0.1	±2.0
125	-0.1	0.0	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±5.0
8000	0.0	0.1	0.1	±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	94.0	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

Cert. No. : ACL25243  
Job No. : VCBAC0118  
Page : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
127.0	127.0	0.0	±1.1
136.9	136.9	0.0	±1.1
135.9	135.9	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	-0.1	±1.1
49.0	48.9	-0.1	±1.1
44.0	43.9	-0.1	±1.1
39.0	38.9	-0.1	±1.1
34.0	33.9	-0.1	±1.1
30.0	29.9	-0.1	±1.1
29.0	28.9	-0.1	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.9	-0.1	±1.1
26.0	26.0	0.0	±1.1
25.0	24.9	-0.1	±1.1

Cert. No. : ACL25243  
Job No. : VCBAC0118  
Page : 7 of 8

## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, T <sub>b</sub> (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	1.0; -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	128.1	0.1	±1.0

Cert. No. : ACL25243  
Job No. : VCBAC0118  
Page : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leq (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-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	133.4	133.1	-0.3	±2.0
Negative half cycle	133.4	133.2	-0.2	±2.0

## 11. Overload indication

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

401-403/100tham Road, Banghura, Bangkok, 10110 Thailand  
Tel: 100-2423-0000 Email: cal@csiporn.comCert. No. : ACL25282  
Page : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-02 / Microphone UC-52 / Pre-amplifier NH-34  
Serial No.: 00710639 / 130405 / 10640  
ID No.: RKK\_FS0023

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHUANG PHATTANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.Location : -  
Ambient Temperature : ( 23.6 ± 1.3 ) °C  
Pressure : ( 101.3 ± 1.3 ) kPa  
Relative Humidity : ( 50.0 ± 2.0 ) %Received Date : 07 JULY 2025  
Calibration Date : 21-23 JULY 2025  
Date of Issue : 25 JULY 2025

Calibrated by : Nathanon Pitsanum

Approved by : Wichak Ekpongma  
( Wichak Ekpongma )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. : ACL25282  
Job No. : VCBAC0144  
Page : 2 of 8

## Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by follow on IEC-61672-1 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic 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	IF-0011-25	11-FEB-26
Waveform Generator	33511B	MY53202742	IF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL-BP 24/0268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL-BP 23/0268	22-APR-26
Digital Multimeter	34461A	MY60024273	CA20251206A	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977960	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-43KA1	34560495	AA-3002-25	19-FEB-26

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 :

- National Institute of Metrology (Thailand).
- Thailand Institute of Scientific and Technological Research (TISTR).
- Electrical And Electronics Institute (EEI).

Cert. No. : ACL25282  
Job No. : VCBAC0144  
Page : 3 of 8

## 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

Cert. No. : ACL25282  
Job No. : VCBAC0144  
Page : 4 of 8

## Result of calibration :

## 1. Absolute sensitivity

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

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
15.7

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

Frequency Weighting (dB)	Weighting (dB)
A-weight	12.0
C-weight	18.3
Flat	23.9

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits (dB)
125	0.1	0.1	0.2	±1.5
1000	0.0	0.0	0.0	±1.0
8000	1.2	1.3	1.3	±5.0

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)			Acceptance Limits
	Flat	C-weight	A-weight	
63	0.0	-0.1	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±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	94.0	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
Log	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	94.1	0.1	±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	±1.0
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
29.0	29.0	-0.1	±1.1
24.0	24.0	0.0	±1.1
19.0	19.0	0.0	±1.1
14.0	14.0	0.0	±1.1
9.0	9.0	0.0	±1.1
4.0	4.0	0.0	±1.1

## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, T <sub>b</sub> (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	1.0; -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	128.1	0.1	±1.0

## 10. Peak C sound level

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

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.9	133.1	-0.8	±2.0
Positive half cycle	135.4	135.2	-0.2	±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	-0.1	±1.5
89.6		

## 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



## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : SL-42 / Microphone UC-32 / Pre-amplifier NF-24  
Serial No. : 00710640 / 170325 / 73077  
ID No. : BCK\_F50024

## Condition As Found :

GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHAOYANG PHATTANAKAN, KHUET SAN LUANG,  
BANGKOK, 10250 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 1 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 06 JUNE 2025  
Calibration Date : 17 JUNE 2025  
Date of Issue : 18 JUNE 2025

Calibrated by : Hathakorn Pisuaporn

Approved by : Wichok Ekpongpradit  
( Wichok Ekpongpradit )

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

## Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by follow on IEC-6167-1 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency-weighting with A-weighting and Reference  
Standard Instruments.

For items results of each item were made by observation of each instrument 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY5202242	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	SEL-AP-3442068	22-APR-26
Digital Multimeter	33461A	MY53220076	SEL-AP-3442068	22-APR-26
Digital Multimeter	34461A	MY60024273	CA3021208A	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAL	34560495	AA-3002-25	19-FEB-26

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

3. This certificate is transferable to the international system of units maintained at :

1. National Institute of Metrology (Thailand).
2. Thailand Institute of Scientific and Technological Research (TISTR).
3. Electrical and Electronic Institute (EEI).

## Summary of Measurement Results :

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

## Result of calibration :

## 1. Absolute sensitivity

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

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
18.2

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

Frequency Weighting	Weighting (dB)
A-weight	12.0
C-weight	18.2
Flat	23.9

## 3. Acoustical signal tests of frequency weightings

Metre free-field acoustic response at a level of 94 dB

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.2	± 1.5
1000	0.0	0.1	0.1	± 1.0
8000	-0.2	-0.2	-0.2	±5.0

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	-0.1	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.1	±2.0
4000	0.0	0.1	0.1	±3.0
8000	0.0	0.1	0.1	±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	94.0	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
Log	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	94.1	0.1	±0.3



Cert. No. : ACL25244  
Job No. : VCMRAC0118  
Pages : 4 of 8

## 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	134.1	0.1	+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	119.1	0.1	+1.1
114.0	114.0	0.0	+1.1
109.0	109.0	0.0	+1.1
104.0	104.1	0.1	+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	30.0	0.0	+1.1
29.0	29.1	0.1	+1.1
28.0	28.0	0.0	+1.1
27.0	27.1	0.1	+1.1
26.0	26.1	0.1	+1.1
25.0	25.1	0.1	+1.1

Cert. No. : ACL25244  
Job No. : VCMRAC0118  
Pages : 7 of 8

## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	+1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, T <sub>b</sub> (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	116.9	-0.1	1.0; -2.5
	200	800	134.0	134.0	0.0	+1.0
Slow	2	8	106.0	107.9	+0.1	1.0; -5.0
	200	800	127.6	127.6	0.0	+1.0
	0.25	1	99.0	98.8	-0.2	1.5; -5.0
SEL	2	8	108.0	107.9	-0.1	1.0; -2.5
	200	800	128.0	128.0	0.0	+1.0

Cert. No. : ACL25244  
Job No. : VCMRAC0118  
Pages : 8 of 8

## 10. Peak C sound level

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	+3.0
One	133.4	133.3	-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	135.1	-0.3	+2.0

## 11. Overload indication

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

401-403/3 Sathorn Road, Bangkok, Thailand 10120 (Thailand)  
Tel: +66 (0)2 551 9335 Email: cal@siptorn.comCert. No. : ACL25089  
Job No. : VCMRAC0063  
Pages : 2 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : MICH  
Model : NL 42 / Microphone IEC 57 / Pre-amplifier NF-24  
Serial No. : 00638237 / 157780 / 48005  
ID No. : BKC\_F50096

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATHANAKAN 40, PHATHANAKAN ROAD,  
KHAOYANG PHATHANAKAN, KHUET SUAN LUANG,  
BANGKOK, 10250 (THAILAND)

Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.9 ± 20 ) %

Received Date : 14 JANUARY 2025  
Calibration Date : 27-29 JANUARY 2025  
Date of Issue : 30 JANUARY 2025

Calibrated by : Nithakorn Pongpant

Approved by :  
( Nithakorn Pongpant )

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.

Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by follow on ISO-61672-1 (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 test results of each item 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-0009-34	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-34	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 210067	13-FEB-25
Digital Multimeter	33461A	MY53220016	EEL-BP 220067	15-FEB-25
Digital Multimeter	33461A	MY60024273	EEL-BP 220067	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-34	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

2. This result of calibration was found accurate as shown on data 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).

## 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

Cert. No. : ACL25089  
Job No. : VCMRAC0063  
Page : 4 of 8

## Result of calibration :

## 1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.94)	93.9	0.0	+0.3

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
17.1

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

Frequency Weighting	Weighting (dB)
A-weight	12.6
C-weight	18.8
Flat	24.7

## 3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.3	0.5	+1.5
1000	0.2	0.2	0.2	+1.0
8000	-0.1	-0.1	-0.1	+5.0

Cert. No. : ACL25089  
Job No. : VCMRAC0063  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	+2.0
125	0.0	0.0	0.0	+1.5
250	0.0	0.0	-0.1	+1.5
500	0.0	0.0	0.0	+1.5
1000	0.0	0.0	0.0	+1.0
2000	0.0	0.0	0.0	+2.0
4000	0.0	0.0	0.0	+2.0
8000	0.0	0.1	0.1	+2.0

## 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	94.0	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

Cert. No. : ACL25089  
Job No. : VCMRAC0063  
Pages : 6 of 8

## 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	30.0	0.0	+1.1
29.0	29.0	0.0	+1.1
28.0	28.0	0.0	+1.1
27.0	27.0	0.0	+1.1
26.0	26.0	0.0	+1.1
25.0	25.0	0.0	+1.1

## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.8	-0.2	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, T <sub>b</sub> (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

SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY409-409/1 Sirithorn Road, Bangpujima, Bangkok, 10700 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com

## 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	ET-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	ET-0007-24	05-FEB-25
Digital Multimeter	33461A	MY52200106	EEL-BP-210267	13-FEB-25
Digital Multimeter	33461A	MY52200076	EEL-BP-200267	13-FEB-25
Digital Multimeter	34461A	MY80024273	EEL-BP-220267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	ET-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAJ	3456495	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 :

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

## 10. Peak C sound level

Number of cycle is test signal	Anticipated Value (dB)	Measured Value, 1 speech (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.1	0.1	±2.0
Positive half cycle	135.4	135.3	-0.1	±2.0
Negative half cycle	135.4	135.3	-0.1	±2.0

## 11. Overload indication

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle		
89.5	89.4	-0.1	±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

409-409/1 Sirithorn Road, Bangpujima, Bangkok, 10700 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Transmitter NH-24  
Serial No. : 0068243 / 157783 / 48098  
ID No. : BKK\_FS0100

Condition As Found : GOOD

Customer : AIS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHWAENG PHATTANAKAN, KHEI SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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



Received Date : 09 AUGUST 2024  
Calibration Date : 30 AUGUST 2024  
Date of Issue : 01 SEPTEMBER 2024

Calibrated by : Natsakorn Pitsupitum

Approved by : *T. Petch*  
( Thanakul Petchai )

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.

SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY409-409/1 Sirithorn Road, Bangpujima, Bangkok, 10700 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com

## 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

SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY409-409/1 Sirithorn Road, Bangpujima, Bangkok, 10700 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com

## Result of calibration :

## 1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
95.9 (93.94)	95.9	0.0	±0.3

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
15.4

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

Frequency Weighting	Weighting (dB)
A-weight	17.6
C-weight	16.8
Flat	34.4

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance limits
125	0.2	0.2	0.2	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.8	-1.7	-1.7	±5.0

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## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±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	94.0	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)
Flat	94.0	94.0	0.0	±0.1
Slow	94.0	94.0	0.0	±0.1
Fast	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

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## 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
117.0	117.0	0.0	±1.1
136.0	136.0	0.0	±1.1
155.0	155.0	0.0	±1.1
174.0	174.0	0.0	±1.1
193.0	193.0	0.0	±1.1
212.0	212.0	0.0	±1.1
231.0	231.0	0.0	±1.1
250.0	250.0	0.0	±1.1
269.0	269.0	0.0	±1.1
288.0	288.0	0.0	±1.1
307.0	307.0	0.0	±1.1
326.0	326.0	0.0	±1.1
345.0	345.0	0.0	±1.1
364.0	364.0	0.0	±1.1
383.0	383.0	0.0	±1.1
402.0	402.0	0.0	±1.1
421.0	421.0	0.0	±1.1
440.0	440.0	0.0	±1.1
459.0	459.0	0.0	±1.1
478.0	478.0	0.0	±1.1
497.0	497.0	0.0	±1.1
516.0	516.0	0.0	±1.1
535.0	535.0	0.0	±1.1
554.0	554.0	0.0	±1.1
573.0	573.0	0.0	±1.1
592.0	592.0	0.0	±1.1
611.0	611.0	0.0	±1.1
630.0	630.0	0.0	±1.1
649.0	649.0	0.0	±1.1
668.0	668.0	0.0	±1.1
687.0	687.0	0.0	±1.1
706.0	706.0	0.0	±1.1
725.0	725.0	0.0	±1.1
744.0	744.0	0.0	±1.1
763.0	763.0	0.0	±1.1
782.0	782.0	0.0	±1.1
801.0	801.0	0.0	±1.1
820.0	820.0	0.0	±1.1
839.0	839.0	0.0	±1.1
858.0	858.0	0.0	±1.1
877.0	877.0	0.0	±1.1
896.0	896.0	0.0	±1.1
915.0	915.0	0.0	±1.1
934.0	934.0	0.0	±1.1
953.0	953.0	0.0	±1.1
972.0	972.0	0.0	±1.1
991.0	991.0	0.0	±1.1
1010.0	1010.0	0.0	±1.1
1029.0	1029.0	0.0	±1.1
1048.0	1048.0	0.0	±1.1
1067.0	1067.0	0.0	±1.1
1086.0	1086.0	0.0	±1.1
1105.0	1105.0	0.0	±1.1
1124.0	1124.0	0.0	±1.1
1143.0	1143.0	0.0	±1.1
1162.0	1162.0	0.0	±1.1
1181.0	1181.0	0.0	±1.1
1200.0	1200.0	0.0	±1.1
1219.0	1219.0	0.0	±1.1
1238.0	1238.0	0.0	±1.1
1257.0	1257.0	0.0	±1.1
1276.0	1276.0	0.0	±1.1
1295.0	1295.0	0.0	±1.1
1314.0	1314.0	0.0	±1.1
1333.0	1333.0	0.0	±1.1
1352.0	1352.0	0.0	±1.1
1371.0	1371.0	0.0	±1.1
1390.0	1390.0	0.0	±1.1
1409.0	1409.0	0.0	±1.1
1428.0	1428.0	0.0	±1.1
1447.0	1447.0	0.0	±1.1
1466.0	1466.0	0.0	±1.1
1485.0	1485.0	0.0	±1.1
1504.0	1504.0	0.0	±1.1
1523.0	1523.0	0.0	±1.1
1542.0	1542.0	0.0	±1.1
1561.0	1561.0	0.0	±1.1
1580.0	1580.0	0.0	±1.1
1599.0	1599.0	0.0	±1.1
1618.0	1618.0	0.0	±1.1
1637.0	1637.0	0.0	±1.1
1656.0	1656.0	0.0	±1.1
1675.0	1675.0	0.0	±1.1
1694.0	1694.0	0.0	±1.1
1713.0	1713.0	0.0	±1.1
1732.0	1732.0	0.0	±1.1
1751.0	1751.0	0.0	±1.1
1770.0	1770.0	0.0	±1.1
1789.0	1789.0	0.0	±1.1
1808.0	1808.0	0.0	±1.1
1827.0	1827.0	0.0	±1.1
1846.0	1846.0	0.0	±1.1
1865.0	1865.0	0.0	±1.1
1884.0	1884.0	0.0	±1.1
1903.0	1903.0	0.0	±1.1
1922.0	1922.0	0.0	±1.1
1941.0	1941.0	0.0	±1.1
1960.0	1960.0	0.0	±1.1
1979.0	1979.0	0.0	±1.1
1998.0	1998.0	0.0	±1.1
2017.0	2017.0	0.0	±1.1
2036.0	2036.0	0.0	±1.1
2055.0	2055.0	0.0	±1.1
2074.0	2074.0	0.0	±1.1
2093.0	2093.0	0.0	±1.1
2112.0	2112.0	0.0	±1.1
2131.0	2131.0	0.0	±1.1
2150.0	2150.0	0.0	±1.1
2169.0	2169.0	0.0	±1.1
2188.0	2188.0	0.0	±1.1
2207.0	2207.0	0.0	±1.1
2226.0	2226.0	0.0	±1.1
2245.0	2245.0	0.0	±1.1
2264.0	2264.0	0.0	±1.1
2283.0	2283.0	0.0	±1.1
2302.0	2302.0	0.0	±1.1
2321.0	2321.0	0.0	±1.1
2340.0	2340.0	0.0	±1.1
2359.0	2359.0	0.0	±1.1
2378.0	2378.0	0.0	±1.1
2397.0	2397.0	0.0	±1.1
2416.0	2416.0	0.0	±1.1
2435.0	2435.0	0.0	±1.1
2454.0	2454.0	0.0	±1.1
2473.0	2473.0	0.0	±1.1
2492.0	2492.0	0.0	±1.1
2511.0	2511.0	0.0	±1.1
2530.0	2530.0	0.0	±1.1
2549.0	2549.0	0.0	±1.1
2568.0	2568.0	0.0	±1.1
2587.0	2587.0	0.0	±1.1
2606.0	2606.0	0.0	±1.1
2625.0	2625.0	0.0	±1.1
2644.0	2644.0	0.0	±1.1
2663.0	2663.0	0.0	±1.1
2682.0	2682.0	0.0	±1.1
2701.0	2701.0	0.0	±1.1
2720.0	2720.0	0.0	±1.1
2739.0	2739.0	0.0	±1.1
2758.0	2758.0	0.0	±1.1
2777.0	2777.0	0.0	±1.1
2796.0	2796.0	0.0	±1.1
2815.0	2815.0	0.0	±1.1
2834.0	2834.0	0.0	±1.1
2853.0	2853.0	0.0	±1.1
2872.0	2872.0	0.0	±1.1
2891.0	2891.0	0.0	±1.1
2910.0	2910.0	0.0	±1.1
2929.0	2929.0	0.0	±1.1
2948.0	2948.0	0.0	±1.1
2967.0	2967.0	0.0	±1.1
2986.0	2986.0	0.0	±1.1
3005.0	3005.0	0.0	±1.1
3024.0	3024.0	0.0	±1.1
3043.0	3043.0	0.0	±1.1
3062.0	3062.0	0.0	±1.1
3081.0	3081.0	0.0	±1.1
3100.0	3100.0	0.0	±1.1
3119.0	3119.0	0.0	±1.1
3138.0	3138.0	0.0	±1.1
3157.0	3157.0	0.0	±1.1
3176.0	3176.0	0.0	±1.1
3195.0	3195.0	0.0	±1.1
3214.0	3214.0	0.0	±1.1
3233.0	3233.0	0.0	±1.1
3252.0	3252.0	0.0	±1.1
3271.0	3271.0	0.0	±1.1
3290.0	3290.0	0.0	±1.1
3309.0	3309.0	0.0	±1.1
3328.0	3328.0	0.0	±1.1
3347.0	3347.0	0.0	±1.1
3366.0	3366.0	0.0	±1.1
3385.0	3385.0	0.0	±1.1
3404.0	3404.0	0.0	±1.1
3423.0	3423.0	0.0	±1.1
3442.0	3442.0	0.0	±1.1
3461.0	3461.0	0.0	±1.1
3480.0	3480.0	0.0	±1.1
3499.0	3499.0	0.0	±1.1
3518.0	3518.0	0.0	±1.1
3537.0	3537.0	0.0	±1.1
3556.0	3556.0	0.0	±1.1
3575.0	3575.0	0.0	±1.1
3594.0	3594.0	0.0	±1.1
3613.0	3613.0	0.0	±1.1
3632.0	3632.0	0.0	±1.1
3651.0	3651.0	0.0	±1.1
3670.0	3670.0	0.0	±1.1
3689.0	3689.0	0.0	±1.1
3708.0	3708.0	0.0	±1.1
3727.0	3727.0	0.0	±1.1
3746.0	3746.0	0.0	±1.1
3765.0	3765.0	0.0	±1.1
3784.0	3784.0	0.0	±1.1
3803.0	3803.0	0.0	±1.1
3822.0	3822.0	0.0	±1.1
3841.0	3841.0	0.0	±1.1
3860.0	3860.0	0.0	±1.1
3879.0	3879.0	0.0	±1.1
3898.0	3898.0	0.0	±1.1
3917.0	3917.0	0.0	±1.1
3936.0	3936.0	0.0	±1.1
3955.0	3955.0	0.0	±1.1
3974.0	3974.0	0.0	±1.1
3993.0	3993.0	0.0	±1.1
4012.0	4012.0	0.0	±1.1
4031.0	4031.0	0.0	±1.1
4050.0	4050.0	0.0	±1.1
4069.0	4069.0	0.0	±1.1
4088.0	4088.0	0.0	±1.1
4107.0	4107.0	0.0	±1.1
4126.0	4126.0	0.0	±1.1
4145.0	4145.0	0.0	±1.1
4164.0	4164.0	0.0	±1.1
4183.0	4183.0	0.0	±1.1
4202.0	4202.0	0.0	±1.1
4221.0	4221.0	0.0	±1.1
4240.0	4240.0	0.0	±1.1
4259.0	4259.0	0.0	±1.1
4278.0	4278.0	0.0	±1.1
4297.0	4297.0	0.0	±1.1
4316.0	4316.0	0.0	±1.1
4335.0	4335.0	0.0	±1.1
4354.0	4354.0	0.0	±1.1
4373.0	4373.0	0.0	±1.1
4392.0	4392.0	0.0	±1.1
4411.0	4411.0	0.0	±1.1
4430.0	4430.0	0.0	±1.1
4449.0	4449.0	0.0	±1.1
4468.0	4468.0	0.0	±1.1
4487.0	4487.0	0.0	±1.1
4506.0	4506.0	0.0	±1.1
4525.0	4525.0	0.0	±1.1
4544.0	4544.0	0.0	±1.1
4563.0	4563.0	0.0	±1.1
4582.0	4582.0	0.0	±1.1
4601.0	4601.0	0.0	±1.1
4620.0	4620.0	0.0	±1.1
4639.0	4639.0	0.0	±1.1
4658.0	4658.0	0.0	±1.1
4677.0	4677.0	0.0	±1.1
4696.0	4696.0	0.0	±1.1
4715.0	4715.0	0.0	±1.1
4734.0	4734.0	0.0	±1.1
4753.0	4753.0	0.0	±1.1
4772.0	4772.0	0.0	±1.1
4791.0	4791.0	0.0	±1.1
4810.0	4810.0	0.0	±1.1
4829.0	4829.0	0.0	±1.1
4848.0	4848.0	0.0	±1.1
4867.0	4867.0	0.0	±1.1
4886.0	4886.0	0.0	±1.1
4905.0	4905.0	0.0	±1.1
4924.0	4924.0	0.0	±1.1
4943.0	4943.0	0.0	±1.1
4962.0	4962.0	0.0	±1.1
4981.0	4981.0	0.0	±1.1
5000.0	5000.0	0.0	±1.1



Cert. No. : ACL25245  
Job No. : VC68AC0118  
Pages : 2 of 8

## Calibration Procedure : CP-AC-BU

## 12. High level stability

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

REVIEW BY M. M. P.  
APPROVED BY [Signature]  
NEXT CAL. DATE 17/08/28

Calibrated by: Nathakorn Pitsungnuan

Approved by : Wichok R.  
(Wichok Ekpongradit)

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Job No. : VC68AC0118  
Pages : 5 of 8

**Result of calibration :**

## 2. Self-generated noise

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

### 3. Acoustical signal tests of frequency weightings

#### 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

### 5. Frequency and time weightings at 1 kHz

### 5.2 Time weighting at 1 kHz

### 6. Long - term stability

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Job No. : VC68AC0118  
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#### 7. Level linearity on the reference level range

### 8. Level linearity including the level range control

### 2. Tone burst response

10. Peak C sound level

### 11. Overload indication

## 12. High level stability

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

Cert. No. : ACL25092  
Page : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No.: 0083818 / 175170 / R3721  
ID No.: RKK\_PSO108

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATHANAKAN 40, PHATHANAKAN ROAD,  
KIWAENG PHATHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 14 JANUARY 2025  
Calibration Date : 27-29 JANUARY 2025  
Date of Issue : 30 JANUARY 2025

REVIEW BY : *[Signature]*  
APPROVED BY : *[Signature]*  
NEXT CAL DATE : 27/01/26

Calibrated by : Natchorn Pichaporn

Approved by : *[Signature]*  
( 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.

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 in Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For test results of each item were made by observation of each instrument 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-0009-24	05-FEB-25
Waveform Generator	33311B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	34461A	MY53209104	EEI-BP 21/0267	13-FEB-25
Digital Multimeter	34461A	MY53209104	EEI-BP 20/0267	13-FEB-25
Digital Multimeter	34461A	MY60054273	EEI-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 NIST :

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

Cert. No. : ACL25092  
Job No. : VCM8AC0063  
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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	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

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Job No. : VCM8AC0063  
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### Result of calibration :

#### 1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
91.9 (93.94)	91.9	0.0	±0.3

#### 2. Self-generated noise

##### 2.1 Noise test

Measured Value (dB)
34.8

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

Frequency Weighting	Weighting (dB)
A-weight	11.6
C-weight	17.9
Flat	23.9

#### 3. Acoustical signal tests of frequency weightings

Free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.0	0.0	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	2.3	2.3	2.3	±5.0

#### 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

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#### 9. Tone burst response

Time Weighting	Time 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; -2.3
	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	128.1	0.1	±1.0

Cert. No. : ACL25092  
Job No. : VCM8AC0063  
Page : 5 of 8

#### 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	-0.1	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±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	94.0	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

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Cert. No. : ACL25092  
Job No. : VCM8AC0063  
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#### 10. Peak C sound level

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

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	135.0	135.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±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	89.5	±1.5
Negative one-half cycle	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	±0.3

### Certificate of Calibration

Customer : ALS Laboratory Group Thailand Co., Ltd.  
Name : ALS Laboratory Group Thailand Co., Ltd.  
Address : 801 Phatthanakan 40, Phatthanakan Road, Suan Luang, Bangkok 10250  
Certification No. : 25-SLM-130  
Request No. : Req-2025-0775

#### Unit Under Calibration Details

Measurement Item : Sound Level Meter  
Manufacturer : RION  
Model : NL-42  
Serial Number : 0083818  
ID : RKK\_PSO108  
Resolution : 0.1 dB  
Microphone Class : 2  
Microphone Model : UC-52  
Microphone S/N : 175170  
Preamplifier Model : NH-24  
Preamplifier S/N : R3721  
Instrument Status : Used

#### Calibration Environment and Details

Temperature : 23 °C ± 1 °C  
Humidity : 50 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Required Date : 28 March 2025  
Calibrated Date : 28 April 2025  
Calibration Procedure : In-house method (C-SLM-01) based on IEC 61672-3:2013 Electroacoustics - Sound level meters - Part 3: Portable units  
Location of Calibration : Lab Acoustic

Reference Standard	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	Briel-Kjaer	8002	2294980	23 June 2025	NIST
Audio Generator	Sony	SGA-01	131	15 October 2025	UK Electricity

Note : The reported uncertainty is based on stated uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %.

Calibrated By : *[Signature]*  
Mr. Natchorn Pichaporn  
Senior Calibration Engineer

Approved By : *[Signature]*  
Mr. Pich Pichaporn  
Calibration Engineer Supervisor  
Issue Date : 28 April 2025

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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The reading (only) is to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Laboratory (Co., Ltd.)  
ISO 17025:2017, Rev. 01/2024



Certificate No : 25-81-M-150  
Request No : Req-2023-6773

#### 1. Indication at the calibration check frequency

UUC Setting	Normal	Before Adjust	After Adjust	UNCERTAINTY
FAST / A / 30-130	Level	UUC	ERR	UUC
Calibrator Setting	(dB)	(dB)	(dB)	(± dB)
1000 Hz 94 dB	93.77	93.8	93.7	93.8
				0.20

Note: Absolute sensitivity was established by the use of Sontec Calibrator Broad Struck, Model SV35A, SN: 50079

#### 2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	15.4	0.10

#### 3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	11.4	0.10
C	16.0	0.10
Z	19.5	0.10

#### 4. Acoustic signal test of frequency weightings (Without Windscreens)

UUC Setting	Deviation from various Frequency			UNCERTAINTY
FAST / 30-130	Weighting Resonance curve			
STD Setting	A	C	Z	
	(dB)	(dB)	(dB)	(± dB)
125 Hz	0.1	0.4	0.4	0.60
1000 Hz	0.0	0.0	0.0	0.60
4000 Hz	0.0	0.0	0.0	0.60
8000 Hz	-1.2	-1.1	-1.1	0.70

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Instrument Co., Ltd.

ISO 17025:2017 Rev.01 Issue Date: 1/2/23

Certificate No : 25-81-M-150  
Request No : Req-2023-6773

#### 5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting		Deviation from various Frequencies			UNCERTAINTY
FAST / 30-130		Weighting Response curves			(± dB)
STD Setting	A (dB)	C (dB)	Z (dB)		
63 Hz	-0.1	-0.2	-0.1	0.20	
125 Hz	-0.2	-0.1	-0.1		
250 Hz	-0.1	-0.1	-0.1		
500 Hz	-0.1	0.0	0.0		
1000 Hz	0.0	0.0	0.0		
2000 Hz	0.0	0.0	0.0		
4000 Hz	0.0	0.0	0.0		
8000 Hz	0.0	0.0	0.0		
16000 Hz	-1.4	-1.4	0.0		

#### 6. Frequency and time weightings at 1 kHz

UUC Setting	STD	Measured		UNCERTAINTY
FAST / 30-130	REF	UUC	IRR	
UUC Weighting	(dB)	(dB)	(dB)	
A	114.00	114.0	0.0	0.20
C	114.00	114.0	0.0	
Z	114.00	114.0	0.0	

UUC Setting	STD	Measured		UNCERTAINTY
30-130 / A	REF	UUC	ERR	
UUC Time Response	(dB)	(dB)	(dB)	
Fast	114.00	114.0	0.0	± 0.20
Slow	114.00	114.0	0.0	
Long	114.00	114.0	0.0	

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Instrument Co., Ltd.

ISO 17025:2017 Rev.01 Issue Date: 1/2/23

Certificate No : 25-81-M-150  
Request No : Req-2023-6773

#### 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY
FAST / A / 30-130		
STD Setting	(dB)	(± dB)
Initial	114.0	
Final	114.0	
Deviation	0.0	0.00

#### 8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY
FAST dB	REF	UUC	ERR	( ± dB)
	(dB)	(dB)	(dB)	
136.00	136	136.0	0.0	6.30
134.00	134	134.0	0.0	
132.00	129	129.0	0.0	
130.00	128	128.0	0.0	
128.00	124	124.0	0.0	
126.00	124	124.0	0.0	
124.00	124	124.0	0.0	
122.00	124	124.0	0.0	
120.00	100	100.0	0.0	
118.00	104	104.0	0.0	
116.00	99	99.0	0.0	
114.00	94	94.0	0.0	
112.00	80	80.0	0.0	
110.00	84	84.0	0.0	
108.00	76	76.0	0.0	
106.00	74	74.0	0.0	
104.00	60	60.0	0.0	
102.00	64	64.0	0.0	
100.00	59	59.0	0.0	
98.00	54	54.0	0.0	
96.00	49	49.0	0.0	
94.00	46	46.0	0.0	
92.00	42	42.0	0.0	
90.00	38	38.0	0.0	
88.00	36	36.0	0.0	
86.00	34	34.0	0.0	
84.00	32	32.0	0.0	
82.00	30	30.0	0.0	
80.00	28	28.0	0.0	
78.00	26	26.0	0.0	
76.00	24	24.0	0.0	

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Instrument Co., Ltd.

ISO 17025:2017 Rev.01 Issue Date: 1/2/23

Certificate No : 25-81-M-150  
Request No : Req-2023-6773

#### 9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY  ( ± dB)
FAST / A	REF	UUC	ERR	
UUC Range	(dB)	(dB)	(dB)	
30-130	29.60	29.8	0.2	0.30
	114	114.0	0.0	

#### 10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY  ( ± dB)
A / 30-130	Touchstart (ms)	Ref (dB)	UUC (dB)	ERR (dB)	
UUC Time Response					
Fast	200	126.0	126.0	0.0	0.20
	2	109.0	108.9	-0.1	
	0.25	100.0	99.8	-0.2	
Slow	200	119.6	119.5	-0.1	
	2	100.0	99.9	-0.1	
	200	120.0	120.0	0.0	
SIL	2	100.0	99.9	-0.1	
	0.25	91.0	90.8	-0.2	

#### 11. Peak C sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY
FAST / C / 55-141	REF	UUC	ERR	
STD Setting	(dB)	(dB)	(dB)	( ± dB)
Complete cycle	136.4	136.3	-0.10	0.20
Positive half cycle	135.4	135.2	-0.20	
Negative half cycle	135.4	135.2	-0.20	

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Instrument Co., Ltd.

ISO 17025:2017 Rev.01 Issue Date: 1/2/23

Certificate No : 25-81-M-150  
Request No : Req-2023-6773

#### 12. Overload indication

UUC Setting	Measured	UNCERTAINTY
FAST / A / 30-130		
STD Setting	(dB)	(± dB)
Positive over-half cycle	139.4	
Negative over-half cycle	139.4	
Deviation	0.0	0.20

#### 13. High Level Stability

UUC Setting	Measured	UNCERTAINTY
FAST / A / 30-130		
STD Setting	(dB)	(± dB)
Initial	129.0	
Final	129.0	
Drift/level	0.0	0.10

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Instrument Co., Ltd.

ISO 17025:2017 Rev.01 Issue Date: 1/2/23

Cert. No : ACL24261  
Page : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-24  
Serial No.: 00597161 / 130404 / 88174  
ID No.: BKK\_FS0896

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
164 THATHANAKARN RD. PHATHANAKARN ROAD,  
KIWAENG PHATHANAKARN, KHU SIHAN JIANG,  
BANGKOK, 10250 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %  
Received Date : 08 AUGUST 2024  
Calibration Date : 23 AUGUST 2024  
Date of Issue : 26 AUGUST 2024

REVIEW BY : *Handwritten Signature*  
APPROVED BY : *Handwritten Signature*  
NEXT DUE DATE : 25/8/25

Calibrated by : Nuthakorn Pitsupatun

Approval by : *Handwritten Signature*  
( Thakul Petchum )

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.

## SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

405-406/1 Sathorn Road, Bangrak, Bangkok, 10120 Thailand  
Tel : 02-2432 8320 Email : calibration@sithiporn.com

Cert. No : ACL24261  
Job No : VC67ACB139  
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 test results of each item 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	MY48017976	EF-0069-24	05-FEB-25
Waveform Generator	33511B	MY53202742	EF-0007-24	05-FEB-25
Digital Multimeter	34461A	MY5320104	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	34461A	MY5320076	EEL-BP 20/0267	13-FEB-25
Digital Multimeter	34461A	MY90604273	EEL-BP 22/0267	13-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-42KAJ	34509495	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 as :

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

## SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

405-406/1 Sathorn Road, Bangrak, Bangkok, 10120 Thailand  
Tel : 02-2432 8320 Email : calibration@sithiporn.com

Cert. No : ACL24261  
Job No : VC67ACB139  
Pages : 3 of 8

#### 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 20 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

#### 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)
15.

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-6.1	-3.1	+2.0
125	0.0	0.0	0.0	+1.5
250	0.0	0.0	0.0	+1.5
500	0.0	0.0	0.0	+1.5
1000	0.0	0.0	0.0	+1.0
2000	0.0	0.0	0.0	+2.0
4000	0.0	0.0	0.0	+3.0
8000	0.0	0.1	0.1	+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	94.0	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

Z. Petch

## 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	-0.1	+1.1
74.0	74.0	0.0	+1.1
69.0	69.0	0.0	+1.1
64.0	63.9	-0.1	+1.1
59.0	59.0	0.0	+1.1
54.0	53.9	-0.1	+1.1
49.0	48.9	-0.1	+1.1
44.0	44.0	0.0	+1.1
39.0	38.9	-0.1	+1.1
34.0	34.0	0.0	+1.1
29.0	29.0	0.0	+1.1
24.0	24.0	0.0	+1.1
19.0	19.0	0.0	+1.1
14.0	14.0	0.0	+1.1
9.0	9.0	0.0	+1.1
4.0	4.0	0.0	+1.1

Z. Petch

## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.1	0.1	+1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, 1s	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

Z. Petch

## 10. Peak C sound level

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	+3.0
One	133.4	133.3	-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	133.4	133.7	+0.2	+2.0
Negative half cycle	133.4	133.2	-0.2	+2.0

## 11. Overload indication

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

Z. Petch

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Pyramphor N8-24  
Serial No. : 00997162 / 171618 / 72790  
ID No. : BCK\_F50897

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHWAENG PHATTANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 07 JANUARY 2023  
Calibration Date : 21 - 23 JANUARY 2023  
Date of Issue : 24 JANUARY 2023

REVIEW BY : *[Signature]*  
APPROVED BY : *[Signature]*  
NEXT CAL DATE : 21/01/28

Calibrated by : Nuthakorn Petchsri

Approved by : *Z. Petch*  
(Nuthakorn Petchsri)

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.

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 weightings with Acoustic chamber and Reference Standard Instruments.

For test results of each item were made by observation of each instrument 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	MY48017078	EP-0099-24	05-FEB-25
Waveform Generator	33511B	MY53202742	EP-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-EP-210267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-EP-200267	15-FEB-25
Digital Multimeter	34461A	MY6004273	EEL-EP-220267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EP-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).

Z. Petch

## 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

Z. Petch

## 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)
14.6

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

Frequency Weighting	Weighting (dB)
A-weight	9.9
C-weight	16.8
Flat	22.6

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.2	0.3	+1.5
1000	0.1	0.1	0.1	+1.0
8000	0.1	0.1	0.1	+5.0

Z. Petch

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	0.0	+2.0
125	0.0	0.0	0.0	+1.5
250	0.0	0.0	0.0	+1.5
500	0.0	0.0	0.0	+1.5
1000	0.0	0.0	0.0	+1.0
2000	0.0	0.0	0.0	+2.0
4000	0.0	0.0	0.0	+3.0
8000	0.0	0.1	0.1	+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	94.0	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

Z. Petch



## 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	132.9	-0.1	+1.1
132.0	131.9	-0.1	+1.1
131.0	130.9	-0.1	+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	30.0	0.0	+1.1
29.0	29.0	0.0	+1.1
28.0	28.0	0.0	+1.1
27.0	27.1	0.1	+1.1
26.0	26.1	0.1	+1.1
25.0	25.1	0.1	+1.1

## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	+1.1

## 9. Tone burst response

Time	Tone burst duration, T <sub>b</sub> (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

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	+1.0
Line	133.4	133.4	0.0	+1.0

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	135.2	-0.2	+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	Negative one-half cycle		
89.5	89.5	0.0	+1.5

## 12. High level stability

Frequency	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Weighting	137.0	137.0	0.0	+0.3
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

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-45 / Microphone UC-52 / Pre-amplifier NH-24  
Serial No. : 02597164 / 180407 / 38177  
ID No. : BKK\_F30099

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KJEE SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 05 NOVEMBER 2024  
Calibration Date : 14-18 NOVEMBER 2024  
Date of Issue : 18 NOVEMBER 2024

Calibrated by : Nisham Pitsunim

Approved by :  
T. Petch-  
( Thanakul Petchun )

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.

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 test results of each item 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	3320A	MY48017616	EP-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EP-0007-24	05-FEB-25
Signal Multimeter	33461A	MY53220104	FPI-1P-110767	15-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-1P-201027	15-FEB-25
Digital Multimeter	34461A	MY60042473	EEL-1P-221027	15-FEB-25
Programmable Attenuator	3MAT-1070	62100114	EP-0008-24	05-FEB-25
Condenser Microphone	4188	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	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).

## Result of calibration :

## 1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limit (dB)
93.9 (91.94)	93.9	0.0	+0.3

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
14.8

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

Frequency Weighting	Weighting (dB)
A-weight	11.6
C-weight	17.6
Flat	23.4

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.2	0.3	0.3	+1.5
1000	0.1	0.1	0.1	+1.0
8000	1.0	1.1	1.1	+5.0

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	0.0	+2.0
125	0.0	0.0	-0.1	+1.5
250	0.0	0.0	-0.1	+1.5
500	0.0	0.0	-0.1	+1.5
1000	0.0	0.0	0.0	+1.0
2000	0.0	0.0	0.0	+2.0
4000	0.0	0.0	0.0	+3.0
8000	0.0	0.0	0.0	+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	94.0	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	94.1	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	94.1	0.1	+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	104.1	0.1	+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	30.0	0.0	+1.1
29.0	29.1	0.1	+1.1
28.0	28.1	0.1	+1.1
27.0	27.1	0.1	+1.1
26.0	26.2	0.2	+1.1
25.0	25.2	0.2	+1.1

SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY

401-403 Srinthorn Road, Bangpurnu, Bangkok, 10700 Thailand  
Tel: +66 2433 8339 Email: calibration@sithiporn.com



Cert. No. : ACL24355  
Job No. : VC68AC0029  
Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits
130	29.0	29.5	0.5	±1.1

9. Tone burst response

Time	Tone burst duration, T <sub>b</sub> (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	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	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	128.1	0.1	±1.0

10. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured Value, Leq (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±1.0
One	135.4	135.1	-0.3	±2.0

11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)	
Positive one-half cycle	89.5	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

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 item 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	MY5320274	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY5320274	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY5322004	EF-0007-24	15-FEB-25
Digital Multimeter	33461A	MY5322006	EEL-BP 22/0267	15-FEB-25
Digital Multimeter	33461A	MY6002423	EEL-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	3456995	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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Cert. No. : ACL24355  
Job No. : VC68AC0029  
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time 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

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Job No. : VC68AC0029  
Pages : 8 of 8

10. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured Value, Leq (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±1.0
One	135.4	135.1	-0.3	±2.0

Number of cycles in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	135.0	135.0	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		
89.5	89.5	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 calibration, providing a level of confidence of approximately 95 %

End of Calibration Certificate

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CALIBRATION LABORATORY

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Tel: +66 2433 8339 Email: calibration@sithiporn.com



Cert. No. : ACL24355  
Job No. : VC68AC0029  
Pages : 3 of 8

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

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CALIBRATION LABORATORY

401-403 Srinthorn Road, Bangpurnu, Bangkok, 10700 Thailand  
Tel: +66 2433 8339 Email: calibration@sithiporn.com



Cert. No. : ACL24355  
Job No. : VC68AC0029  
Pages : 1 of 8

Calibration Certificate

Equipment : SOUND LEVEL METER.  
Manufacturer : RION  
Model : NR-42 / Microphone UC-52 / Pre-amplifier NH-24  
Serial No. : 0009745 / 180408 / 88178  
ID No. : RCK, PS1009

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHAENG PHATTANAKAN, KIET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 05 NOVEMBER 2024  
Calibration Date : 14-18 NOVEMBER 2024  
Date of Issue : 18 NOVEMBER 2024

Calibrated by : Nithakorn Pongpim

Approved by :  
( Thanakul Pechuri )

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.

SITHIPORN ASSOCIATES CO., LTD.  
CALIBRATION LABORATORY

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Cert. No. : ACL24355  
Job No. : VC68AC0029  
Page : 4 of 8

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)
14.8

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

Frequency Weighting	Weighting (dB)
A-weight	11.6
C-weight	17.8
Flat	23.7

3. Acoustical signal tests of frequency weightings

Mean free-field acoustic response at a level of 94 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	±1.5
1000	0.2	0.2	0.2	±1.0
8000	1.0	1.1	1.1	±5.0

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Tel: +66 2433 8339 Email: calibration@sithiporn.com



Cert. No. : ACL24355  
Job No. : VC68AC0029  
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	0.0	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time 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

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Job No. : VC68AC0029  
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.9	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	53.9	-0.1	±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	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
24.0	24.0	0.0	±1.1
22.0	22.1	0.1	±1.1
20.0	20.1	0.1	±1.1
25.0	25.0	0.0	±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)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.5	-0.1	±1.1

9. Tone burst response

Time	Tone burst duration, T <sub>b</sub> (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	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

T. Petchuri

T. Petchuri

T. Petchuri



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Pages : 8 of 8

**10. Peak C sound level**

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leqpk (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-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	133.4	133.2	-0.2	±2.0
Negative half cycle	133.4	133.2	-0.2	±2.0

**11. Overload indication**

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

**12. High level stability**

Frequency Weighing	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

T. Petch

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Cert. No. : ACL24357  
Job No. : VC8AC0029  
Pages : 1 of 8

**Calibration Certificate**

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42A / Microphone UC-52 / Preamp/Filter M3-24  
Serial No.: 0902381 / 19627 / 26409  
ID No.: RKK\_F31214

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KRWANG PHATTHANAKAN, KIDET SUAN LUANG,  
BANGKOK, 1025 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 1 ) °C  
Pressure : ( 101.3 ± 1 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 05 NOVEMBER 2024  
Calibration Date : 14-15 NOVEMBER 2024  
Date of Issue : 18 NOVEMBER 2024

Calibrated by : Sithiporn Petchum

Approved by :

T. Petch  
( Thanakul Petchum )

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

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Cert. No. : ACL24357  
Job No. : VC8AC0029  
Pages : 2 of 8

Calibration Procedure : CP-AC-01

**Calibration Method :**

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

For test results of each items were 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
Sound Level Meter	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52307242	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY5320104	EEL-RP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY5320076	EEL-RP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60034273	EEL-RP 22/0267	15-FEB-25
Programmable Attenuator	MAT-107B	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4189	2877990	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-40XA1	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 acceptable 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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Cert. No. : ACL24357  
Job No. : VC8AC0029  
Pages : 3 of 8

**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

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**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)
14.2

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

Frequency Weighting	Weighting (dB)
A-weight	10.8
C-weight	17.2
Flat	22.8

**3. Acoustical signal tests of frequency weightings**

**Mean free-field acoustic response at a level of 84 dB**

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	±1.5
1000	0.2	0.2	0.2	±1.0
8000	0.6	0.7	0.7	±0.8

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Job No. : VC8AC0029  
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	0.0	0.0	-0.1	±1.5
250	-0.1	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±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	94.0	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
Long	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

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**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	135.1	0.1	±1.1
134.0	134.1	0.1	±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	129.1	0.1	±1.1
124.0	124.0	0.0	±1.1
119.0	119.1	0.1	±1.1
114.0	114.1	0.1	±1.1
109.0	109.0	0.0	±1.1
104.0	104.1	0.1	±1.1
99.0	99.1	0.1	±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	30.0	0.0	±1.1
29.0	28.9	-0.1	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	26.0	0.0	±1.1
25.0	24.9	-0.1	±1.1

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Cert. No. : ACL24357  
Job No. : VC8AC0029  
Pages : 7 of 8

**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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	28.0	28.9	-0.1	±1.1

**9. Tone burst response**

Tone burst results						
Time Weighting	Tone burst duration, T <sub>b</sub> (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	116.9	-0.1	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	99.8	99.8	-0.2	1.5; -5.0
SEL	2	8	108.0	107.9	-0.1	1.0; -2.5
	200	800	128.0	128.0	0.0	±1.0

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**10. Peak C sound level**

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leqpk (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±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	133.4	133.1	-0.3	±2.0
Negative half cycle	133.4	133.1	-0.3	±2.0

**11. Overload indication**

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	89.5	±1.5
Negative one-half cycle	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	±0.3

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

T. Petch

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7/19 MOU 11, 301 BUNTHANONG, 11 TAMBON BANG KANG  
AMPHOE BANG PHU KHAMET PRAKAN PROVINCE, HONGKONG  
TEL: 00853-2101981 FAX: 00853-2101740

Certificate of Calibration  
Customer: ALS Laboratory Group Thailand Co., Ltd.  
Name: 104 Soi Phatthanakan 40, Phatthanakan Road, Sam Luang,  
Bangkok 10250  
Instrument: Acoustic Calibrator  
Model: NC-74  
Serial Number: 34178119  
ID: BKK\_F50632  
Calibration Environment and Details  
Temperature: (23.42 °C)  
Humidity: (50 ± 20 %RH)  
Barometric Pressure: (1013.410 ± 0.01 kPa)  
Received Date: 15 January 2025  
Calibration Date: 16 January 2025  
Location of Calibration: LAB 1 Acoustic  
Calibration Procedure: In-situ method CP-AC-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators  
Traceability: This certificate provides traceability of measurements to recognized national standard, and to the realization of the International System of Units (SI).  
Note: The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k=2, providing a level of confidence approximately 95%.

Calibrated By: Mr. Noppadol Luangrat  
Approved By: Mr. Pich Mathavon  
Issue Date: 16 January 2025

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7/19 MOU 11, 301 BUNTHANONG, 11 TAMBON BANG KANG  
AMPHOE BANG PHU KHAMET PRAKAN PROVINCE, HONGKONG  
TEL: 00853-2101981 FAX: 00853-2101740

Certificate No: 25-AC-009  
Request No: Req-2025-0090

Sound pressure level  
Calibration Results: Without Adjustment  
Calibration Range (dB) Without Adjustment (dB) Adjustment (dB) Uncertainty Acceptance Limit Results  
94 dB / 1000 Hz 93.82 -0.15 - 0.13 0.25 Pass

Frequency of Sound pressure level  
Calibration Range (Hz) Without Adjustment Measured (dB) Deviated Measured (dB) Deviated Uncertainty Acceptance Limit Results  
94 dB / 1000 Hz 1000.00 0.00 - 0.05 0.70 Pass

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)  
Calibration Range (Hz) Without Adjustment Measured (%) Adjustment (%) Uncertainty Acceptance Limit Results  
94 dB / 1000 Hz 0.71 - 0.40 2.5 Pass

Note:  
Function Maximum permitted Uncertainty of measurement  
Sound pressure level 0.15 dB  
Frequency 0.20%  
Total distortion-noise 0.50%  
\* Acceptance limit was (IEC60942:2017) Class 1  
\* The calibration results include the calibration process correction  
\* The calibration results include the microphone volume correction

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AMPHOE BANG PHU KHAMET PRAKAN PROVINCE, HONGKONG  
TEL: 00853-2101981 FAX: 00853-2101740

Certificate No: 25-AC-009  
Request No: Req-2025-0090

Decision Rule for Assessment of Conformity  
The stated decision rule employed for the assessment of conformity to each calibration result will be applied using GUM-G8:08:2019, facilities on the Reporting of Conformity with Specifications as following P<sub>0</sub> and acceptance.  
Pass: The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.  
Fail: The measurement result was outside the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.  
Fail: The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.

End of Calibration

The results stated only for the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuing Instrument Co., Ltd.

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## Calibration Certificate

Equipment: SOUND LEVEL METER  
Manufacturer: RION  
Model: NL-45 / Microphone UC-52 / Pre-amplifier NH-24  
Serial No.: 00716684 / 157228 / 10645  
ID No.: BKK\_F50632

Condition As Found: GOOD

Customer: ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHUET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location: -  
Ambient Temperature: (23.0 ± 3.1) °C  
Pressure: (101.3 ± 3.1) kPa  
Relative Humidity: (50.0 ± 20) %

Received Date: 08 APRIL 2025  
Calibration Date: 24-25 APRIL 2025  
Date of Issue: 29 APRIL 2025

Calibrated by: Nithiporn Pichaporn

Approved by: T. Petchu  
(Thakul 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 Issuing Calibration Laboratory.

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:

- Reference Standard Instruments  

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Distortion	33210A	MY48017076	EF-0011-25	11-FEB-26
Waveform Generator	33311B	MY52302742	EF-0012-25	11-FEB-26
Digital Multimeter	34461A	MY60024273	CAD0710708A	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	34560495	AA-3002-25	19-FEB-26
- This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.
- This certificate is traceable to the international system of unit maintained at:  
3.1 National Institute of Metrology (Thailand).  
3.2 Electrical And Electronics Institute (EEI).

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	0.0	-0.1	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

5. Frequency and time weightings at 1 kHz

Frequency Weighting	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
	94.0	94.0	0.0	±0.2
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)
	94.0	94.0	0.0	±0.1
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)
	94.0	94.0	0.0	±0.3
A-weight	94.0	94.0	0.0	±0.3

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 1 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. Time 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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CALIBRATION LABORATORY

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)
14.2

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

Frequency Weighting	Weighting (dB)
A-weight	16.8
C-weight	17.3
Flat	23.1

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.0	0.0	0.0	±1.5
1000	0.2	0.2	0.2	±1.0
8000	-3.1	-3.1	-3.0	±5.0

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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	132.9	-0.1	±1.1
132.0	131.9	-0.1	±1.1
131.0	130.9	-0.1	±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	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	26.0	0.0	±1.1
25.0	24.9	-0.1	±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)
130	94.0	94.0	0.0	±1.5

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, T <sub>b</sub> (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	0.25	1	108.0	108.0	0.0	1.0; -5.0
	2	8	127.6	127.6	0.0	±1.0
	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. : ACL25088  
Job No. : YC8AC0863  
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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 item 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-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220194	ELI-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	PEL-BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY69024273	EEI-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-42KAI	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 :

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

Cert. No. : ACL25088  
Job No. : YC8AC0863  
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## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±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	94.0	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

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## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leqpk (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±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	135.4	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

## 11. Overload indication

Measured value ( dB )		Deviated	Acceptance
Positive	Negative	Value	Limits
one-half cycle	one-half cycle	( dB )	( dB )
89.5	89.5	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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Pages : 3 of 8

## 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	0.3	0.6
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	0.3	0.6
For 10 Hz to 4 kHz	0.3	0.7
For > 4 kHz to 10 kHz	0.3	1.0
For > 10 kHz to 20 kHz	0.2	0.2
5. Frequency and time weightings at 1 kHz	0.1	0.1
6. Long-term stability	0.2	0.3
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. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
177.0	177.0	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	53.9	-0.1	±1.1
49.0	49.0	0.0	±1.1
44.0	43.9	-0.1	±1.1
39.0	38.9	-0.1	±1.1
34.0	34.0	0.0	±1.1
29.0	28.9	-0.1	±1.1
24.0	23.9	-0.1	±1.1
19.0	18.9	-0.1	±1.1
14.0	13.9	-0.1	±1.1
9.0	8.9	-0.1	±1.1
4.0	3.9	-0.1	±1.1

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Job No. : YC8AC0863  
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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)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, T <sub>b</sub> (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	0.25	1	108.0	108.0	0.0	1.5; -5.0
	2	8	127.6	127.6	0.0	±1.0
	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	128.1	0.1	±1.0

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## 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)
15.6

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

Frequency Weighting	Weighting (dB)
A-weight	11.2
C-weight	17.4
Flat	23.2

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)	Acceptance Limits
125	0.2	±1.5
1000	0.1	±1.0
8000	0.5	±5.0

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Job No. : YC8AC0863  
Pages : 7 of 8

## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, T <sub>b</sub> (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	0.25	1	108.0	108.0	0.0	1.5; -5.0
	2	8	127.6	127.6	0.0	±1.0
	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	128.1	0.1	±1.0

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## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±5.0
One	133.4	133.5	-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	133.4	135.2	-0.2	±2.0
Negative half cycle	133.4	135.2	-0.2	±2.0

## 11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	
89.6	89.5	-0.1 ±3.5

## 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

Cert. No. : ACL25283  
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## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : EGRON  
Model : NI-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 01022362 / 180410 / 22310  
ID No. : BKK\_390031

Condition As Found : GOOD

Customer : AJS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATHANAKAN 40, PHATHANAKAN ROAD,  
KHUWAENG PHATHANAKAN, KHUET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 07 JULY 2025  
Calibration Date : 21-23 JULY 2025  
Date of Issue : 25 JULY 2025

Calibrated by : Nithakorn Pongpajusa

Approved by : Wichak Ekpongpradit  
( Wichak Ekpongpradit )

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. : ACL25283  
Job No. : VCBAC0144  
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 in Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference  
Standard Instruments.  
For items results of each items were made by observation of each Instruments display and also with SI M's display.

## Condition of this result of calibration :

## 1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33710A	MY348017976	FJ-0011-25	11-FEB-26
Waveform Generator	33511B	MY32302742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY3220104	EEL-BP 24/0258	22-APR-26
Digital Multimeter	33461A	MY3220076	EEL-BP 23/0258	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2023120EA	18-MAR-25
Programmable Attenuator	MAF-1070	63100114	EF-0005-25	11-FEB-26
Condenser Microphone	4130	2777900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KAI	3455095	AA-3002-25	19-FEB-26

2. This result of calibration was found accurate so 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 :

- National Institute of Metrology (Thailand).
- Thailand Institute of Scientific and Technological Research (TISTR).
- Electrical And Electronics Institute (EEI).

Cert. No. : ACL25283  
Job No. : VCBAC0144  
Pages : 3 of 8

## 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	0.3
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	0.3
11. Overload indication	0.2	0.3
12. High level stability	0.1	0.1

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## Result of calibration :

## 1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
93.9 (93.94)	93.9	0.0	±0.3

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
23.50000003

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

Frequency Weighting	Weighting (dB)
A-weight	10.8
C-weight	17.1
Flat	22.7

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	-0.7	-0.7	-0.7	±1.5
1000	0.0	0.0	0.0	±1.0
8000	0.1	0.2	0.1	±5.0

Cert. No. : ACL25283  
Job No. : VCBAC0144  
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## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	0.0	±2.0
125	0.0	0.0	0.0	±1.3
250	0.0	0.0	-0.1	±1.3
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±5.0
8000	0.0	0.1	0.1	±5.0

## 5. Frequency and time weightings at 1 kHz

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

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Job No. : VCBAC0144  
Pages : 6 of 8

## 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	132.9	-0.1	±1.1
132.0	131.9	-0.1	±1.1
131.0	130.9	-0.1	±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	29.9	-0.1	±1.1
29.0	29.0	0.0	±1.1
28.0	27.9	-0.1	±1.1
27.0	26.9	-0.1	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.9	-0.1	±1.1

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Job No. : VCBAC0144  
Pages : 7 of 8

## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, T <sub>b</sub> (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	2	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	1.0; -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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## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±5.0
One	133.4	133.4	0.0	±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	133.4	135.1	-0.3	±2.0
Negative half cycle	133.4	135.2	-0.2	±2.0

## 11. Overload indication

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



Cert. No. : ACL25099  
Page : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-24  
Serial No. : 00638240 / 172153 / 88175  
ID No. : BKX\_F50097

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 1 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 14 JANUARY 2025  
Calibration Date : 27-29 JANUARY 2025  
Date of Issue : 30 JANUARY 2025

Calibrated by : Nattakorn Pitsuppan

Approved by :

REVIEW BY : Nattakorn P.  
APPROVED BY :  
NEXT CAL DATE : 27/01/26

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.

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 Acoustic chamber and Reference Standard instruments.

For tests results of each items were made by observation of each instrument 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-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21-0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	FPE-BP 200047	15-FEB-25
Digital Multimeter	34461A	MY6004273	EEL-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-42EAI	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).

Cert. No. : ACL25099  
Job No. : VCMAC0863  
Pages : 2 of 8

### 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. Time burst response	0.2	0.3
10. Peak C-sound level	0.2	0.35
11. Overload indication	0.2	0.35
12. High level stability	0.1	0.1

Cert. No. : ACL25099  
Job No. : VCMAC0863  
Pages : 3 of 8

Cert. No. : ACL25099  
Job No. : VCMAC0863  
Page : 4 of 8

### 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)
15.1

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

Frequency Weighting	Weighting (dB)
A-weight	12.5
C-weight	18.2
Flat	24.0

#### 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)
	Flat C-weight A-weight Acceptance Limits
125	0.4 0.4 0.4 ±1.5
1000	0.0 0.0 0.0 ±1.0
8000	0.0 0.0 0.0 ±5.0

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Job No. : VCMAC0863  
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#### 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	0.0 0.1 0.0 ±2.0
125	0.0 0.0 0.0 ±1.5
250	0.0 0.0 0.0 ±1.5
500	0.0 0.1 0.0 ±1.5
1000	0.0 0.0 0.0 ±1.0
2000	0.0 0.1 0.0 ±2.0
4000	0.0 0.1 0.0 ±3.0
8000	0.1 0.1 0.1 ±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	94.0	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
Long	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	94.1	0.1	±0.3

Cert. No. : ACL25099  
Job No. : VCMAC0863  
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#### 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	0.1	±1.1
114.0	114.0	0.0	±1.1
109.0	109.0	0.0	±1.1
104.0	104.1	0.1	±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	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.9	-0.1	±1.1

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Job No. : VCMAC0863  
Page : 7 of 8

#### 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±1.1

#### 9. Time burst response

Time Weighting	Time burst duration, T <sub>B</sub> (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5; -2.5
	2	8	117.0	117.0	0.0	1.0; -2.5
	200	800	134.9	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

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Job No. : VCMAC0863  
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#### 10. Peak C-sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>eq</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±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	89.5	±1.5
Negative one-half cycle	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	±0.3

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

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-24  
Serial No. : 00638242 / 157782 / 48097  
ID No. : BKX\_F50099

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 1 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 22 AUGUST 2025  
Calibration Date : 04 SEPTEMBER 2025  
Date of Issue : 08 SEPTEMBER 2025

Calibrated by : Nattakorn Pitsuppan

Approved by :

Nittin Sawan  
( Nittin Sawan )

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Cert. No. : ACL25348  
Job No. : VCMRAC0172  
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 test 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY53202742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL BP 240268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL BP 234028	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	621006114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KA1	34560495	AA-3002-25	19-FEB-26

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).
- 3.3 Electrical And Electronics Institute (EEI).

Cert. No. : ACL25348  
Job No. : VCMRAC0172  
Pages : 3 of 8

## 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	0.3
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

Cert. No. : ACL25348  
Job No. : VCMRAC0172  
Page : 4 of 8

## 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 )
17.4

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

Frequency Weighting	Weighting ( dB )
A - weight	15.7
C - weight	21.5
Flat	27.3

## 3. Acoustical signal tests of frequency weightings

Motor free field acoustic response at a level of 94 dB

Frequency ( Hz )	Flat	C-weight	A-weight	Acceptance Limits
125	-0.5	0.5	0.5	± 1.5
1000	0.1	0.1	0.1	± 1.0
8000	-1.8	-1.7	-1.7	±5.0

Cert. No. : ACL25348  
Job No. : VCMRAC0172  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±0.0
125	0.0	0.0	-0.1	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±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	94.0	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
Low	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

Cert. No. : ACL25348  
Job No. : VCMRAC0172  
Pages : 6 of 8

## 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	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	26.0	0.0	±1.1
25.0	25.0	0.0	±1.1

Cert. No. : ACL25348  
Job No. : VCMRAC0172  
Pages : 7 of 8

## 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

Range	Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
130	29.0	28.9	-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	1.0 ; -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	128.1	0.1	±1.0

Cert. No. : ACL25348  
Job No. : VCMRAC0172  
Pages : 8 of 8

## 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	133.2	-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	135.2	-0.2	±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	±1.5
Negative one-half cycle	89.6	±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

400-401/3 Sathaporn Road, Bangkok, Bangkok 10120, Thailand  
(+66) 02-033-8023 Email: sithiporn@stphiporn.com

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-24  
Serial No. : 00685243 / 157783 / 48098  
ID No. : BRK, F80100

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 30.0 ± 20 ) %  
Received Date : 22 AUGUST 2025  
Calibration Date : 04 SEPTEMBER 2025  
Date of Issue : 05 SEPTEMBER 2025

Calibrated by : Nittanon Pitsanaporn

Approved by :  
( Nittanon Pitsanaporn )  
( Nittanon Sriwanan )

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. : ACL25348  
Job No. : VCMRAC0172  
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 test 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-0011-25	11-FEB-26
Waveform Generator	33511B	MY53202742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY53220104	EEL BP 240268	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL BP 234028	22-APR-26
Digital Multimeter	34461A	MY60024273	CA2025120EA	18-MAR-26
Programmable Attenuator	MAT-1070	621006114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KA1	34560495	AA-3002-25	19-FEB-26

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).
- 3.3 Electrical And Electronics Institute (EEI).



Cert. No. : ACL25349  
Job No. : VC68AC0172  
Pages : 3 of 8

## 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

Cert. No. : ACL25349  
Job No. : VC68AC0172  
Page : 4 of 8

## Result of calibration.:

## 1. Absolute sensitivity

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

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
15.4

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

Frequency Weighting	Weighting (dB)
A - weight	12.6
C - weight	18.8
Flat	24.4

## 3. Acoustical signal tests of frequency weightings

## Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	-0.5	0.5	0.5	±1.5
1000	0.1	0.1	0.1	±1.0
8000	-1.8	-1.7	-1.7	±5.0

Cert. No. : ACL25349  
Job No. : VC68AC0172  
Pages : 5 of 8

## 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	0.0	0.0	-0.1	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±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	94.0	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
1 eq	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

Cert. No. : ACL25349  
Job No. : VC68AC0172  
Pages : 6 of 8

## 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	29.9	-0.1	±1.1
29.0	28.9	-0.1	±1.1
28.0	27.9	-0.1	±1.1
27.0	27.0	0.0	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.8	-0.2	±1.1

Cert. No. : ACL25349  
Job No. : VC68AC0172  
Pages : 7 of 8

## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.8	-0.2	±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	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.0 ; -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	128.1	0.1	±1.0

Cert. No. : ACL25349  
Job No. : VC68AC0172  
Pages : 8 of 8

## 10. Peak C sound level

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

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	135.0	135.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±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	Negative 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

Cert. No. : ACL25383  
Pages : 1 of 6

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NR-02 / Microphone UC-52 / Pre-amplifier NH-24  
Serial No. : 09080517 / 157784 / 420060  
ID No. : BKK\_P00107

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHUWAENG PHATTHANAKAN, KHUET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

Location : -  
Ambient Temperature : ( 25.0 ± 3 ) °C  
Pressure : ( 1013 ± 3 ) hPa  
Relative Humidity : ( 50.0 ± 20 ) %

Received Date : 26 SEPTEMBER 2025  
Calibration Date : 02 OCTOBER 2025  
Date of Issue : 06 OCTOBER 2025

Calibrated by : Nitakorn Pisuwan

Approved by : Nitakorn Pisuwan  
( Nitakorn Pisuwan )

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.

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 in Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference  
Standard Instruments.  
For tests results of each item 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	MY54007076	EF-0012-25	11-FEB-26
Waveform Generator	33511D	MY5320742	EF-0012-25	11-FEB-26
Digital Multimeter	33461A	MY5322004	EEL-BP 2302068	22-APR-26
Digital Multimeter	33461A	MY53220076	EEL-BP 2302068	22-APR-26
Digital Multimeter	34461A	MY60024273	CA20251206A	18-MAR-26
Programmable Attenuator	MAT-1070	62100114	EF-0006-25	11-FEB-26
Condenser Microphone	4180	2977900	AA-1002-25	19-FEB-26
Measuring Amplifier	NA-42KA	34560495	AA-3002-25	19-FEB-26

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 :

- National Institute of Metrology (Thailand).
- Thailand Institute of Scientific and Technological Research (TISTR).
- Theoretical And Electronics Institute (IEI).

Cert. No. : ACL25383  
Job No. : VC68AC0191  
Pages : 3 of 8

## 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

Cert. No. : ACL25383  
Job No. : VCBACB191  
Page : 4 of 8

**Result of calibration :****1. Absolute sensitivity**

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

**2. Self-generated noise****2.1 Normal test**

Measured Value (dB)
17.0633333

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

Frequency Weighting	Weighting (dB)
A-weight	13.1
C-weight	19.2
Flat	25.0

**3. Acoustical signal tests of frequency weightings**

Meter free field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)
	Flat C-weight A-weight Acceptance Limits
125	0.4 0.5 0.5 ±1.5
1000	0.1 0.1 0.1 ±1.0
8000	-0.4 -0.3 -0.3 ±5.0

**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	-0.1 0.0 0.0 ±2.0
125	0.0 0.0 0.0 ±1.5
250	0.0 0.0 0.0 ±1.5
500	0.0 0.0 0.0 ±1.5
1000	0.0 0.0 0.0 ±1.0
2000	0.0 0.0 0.0 ±2.0
4000	0.0 0.0 0.0 ±3.0
8000	0.0 0.1 0.1 ±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	94.0	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
Log	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

Cert. No. : ACL25383  
Job No. : VCBACB191  
Page : 5 of 8

**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	53.9	-0.1	±1.1
49.0	48.9	-0.1	±1.1
44.0	44.0	0.0	±1.1
39.0	38.9	-0.1	±1.1
34.0	33.9	-0.1	±1.1
29.0	29.0	0.0	±1.1
24.0	23.9	-0.1	±1.1
19.0	18.9	-0.1	±1.1
14.0	13.9	-0.1	±1.1
9.0	8.9	-0.1	±1.1
4.0	3.9	-0.1	±1.1

481-45/1 Sathorn Road, Bangkok, Thailand, 10120 Thailand  
Tel: +66 2052 8220 Email: cal@sepiaphon.com

Cert. No. : ACL25383  
Job No. : VCBACB191  
Page : 7 of 8

**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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

**9. Tone burst response**

Time Weighting	Tone burst duration, T <sub>b</sub> (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	1.0 ; 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	128.1	0.1	±1.0

**10. Peak C sound level**

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leptak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-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	135.2	-0.2	±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	Negative: one-half cycle		
89.5	89.6	0.1	±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

**Calibration Certificate**

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Preamplifier NH-34  
Serial No.: 00838323 / 170666 / 73129  
ID No.: BKK\_F80113

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHWAENG PHATTANAKAN, KHEET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 14 JANUARY 2025  
Calibration Date : 27-29 JANUARY 2025  
Date of issue : 30 JANUARY 2025

Calibrated by : Nithadon Pongpisan

Approved by : *T. Pongpisan*  
(Thasakul Pongpisan)

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. : ACL25094  
Job No. : VCBACB063  
Page : 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 item were made by observation of each Instruments display and also with SLM's display.

**Condition of this result of calibration :**

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 210267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 200267	13-FEB-25
Digital Multimeter	34461A	MY60054273	EEL-BP 220267	13-FEB-25
Programmable Attenuator	MA67-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	3450495	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).

**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

Cert. No. : ACL25094  
Job No. : VCBACB063  
Page : 3 of 8

**Result of calibration :****1. Absolute sensitivity**

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

**2. Self-generated noise****2.1 Normal test**

Measured Value (dB)
14.2

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

Frequency Weighting	Weighting (dB)
A-weight	11.2
C-weight	17.4
Flat	23.0

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)
	Flat C-weight A-weight Acceptance Limits
125	0.3 0.3 0.3 ±1.5
1000	0.1 0.1 0.1 ±1.0
8000	-0.2 -0.2 -0.2 ±5.0

*T. Pongpisan*

*T. Pongpisan*

*T. Pongpisan*



Cert. No. : ACL25994  
Job No. : VCBAC0063  
Pages : 5 of 8

## 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	0.0	-0.1	-0.1	±2.0
125	0.0	0.0	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	0.0	±1.0
1000	0.0	0.0	0.0	±2.0
2000	0.0	0.0	0.0	±3.0
4000	0.0	0.1	0.1	±3.0

## 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	94.0	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

T. Petch

Cert. No. : ACL25994  
Job No. : VCBAC0063  
Pages : 6 of 8

## 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
29.0	29.0	0.0	±1.1
24.0	24.0	0.0	±1.1
19.0	19.0	0.0	±1.1
14.0	14.0	0.0	±1.1
9.0	9.0	0.0	±1.1
4.0	4.0	0.0	±1.1

T. Petch

Cert. No. : ACL25994  
Job No. : VCBAC0063  
Pages : 7 of 8

## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

## 9. Time 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	±0.9
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

T. Petch

Cert. No. : ACL25994  
Job No. : VCBAC0063  
Pages : 8 of 8

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±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	135.2	-0.2	±2.0
Negative half cycle	133.4	133.2	-0.2	±2.0

## 11. Overload indication

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

T. Petch

40-105/1 Sathorn Road, Bangkok, Thailand, 10700 Thailand  
Tel: +662-6519100 Email: calibration@sithiporn.com

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NR-42 / Microphone UC-52 / Pre-amplifier NH-34  
Serial No. : 0085825 / 17081 / 72889  
ID No. : BKK\_P50115

## Condition As Found :

GOOD

## Customer :

ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATHANAKAN-40, PHATHANAKAN ROAD,  
KHWAENG PHATHANAKAN, KHEE SIAM LIAO,  
BANGKOK, 10254 THAILAND.

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

Received Date : 14 JANUARY 2023  
Calibration Date : 27-29 JANUARY 2023  
Date of Issue : 30 JANUARY 2023



Calibrated by : Thakorn Pongpattana

Approved by : T. Petch  
( Thakorn Petch )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. : ACL25995  
Job No. : VCBAC0063  
Pages : 5 of 8

## Calibration Procedure : CPAC-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 Acoustic 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	IT-0009-24	05-FEB-23
Waveform Generator	33511B	MY53202742	EF-0007-24	05-FEB-23
Digital Multimeter	35461A	MY53201094	EEL-BIP 21/0267	13-FEB-23
Digital Multimeter	35461A	MY53200976	EEL-BIP 20/0267	13-FEB-23
Digital Multimeter	34461A	MY08002573	EEL-BIP 23/0267	15-FEB-23
Programmable Attenuator	MAT-1079	62100114	EF-0008-24	05-FEB-23
Condenser Microphone	4189	2977900	AA-1001-24	02-FEB-23
Measuring Amplifier	NA-52KA1	34504095	AA-3001-24	05-FEB-23

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).

T. Petch

Cert. No. : ACL25995  
Job No. : VCBAC0063  
Pages : 3 of 8

## 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 test of frequency weightings	0.3	0.6
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	0.3	0.6
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. Time 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

T. Petch

Cert. No. : ACL25995  
Job No. : VCBAC0063  
Page : 4 of 8

## 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)
15.1

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

Frequency Weighting	Level (dB)
A-weight	12.6
C-weight	18.5
Flat	24.1

## 3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.4	0.4	±1.5
1000	0.1	0.1	0.1	±1.0
8000	-1.0	-1.0	-1.0	±5.0

T. Petch

Cert. No. : ACL25995  
Job No. : VCBAC0063  
Pages : 5 of 8

## 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	0.0	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±3.0

## 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	94.0	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

T. Petch

## 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	53.9	-0.1	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1
39.0	38.9	-0.1	±1.1
34.0	34.0	0.0	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	26.0	0.0	±1.1
25.0	25.0	0.0	±1.1

T. Petchu.

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-24  
Serial No.: 0083826 / 138764 / 58770  
ID No.: BKK\_PSH16

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
194 PHA THIANAKARAI 40, PHATHANAKARAN ROAD,  
KHU WAENG PHATHANAKARAN, KHUET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 14 JANUARY 2025  
Calibration Date : 27-29 JANUARY 2025  
Date of Issue : 30 JANUARY 2025

REVIEW BY : *T. Petchu.*  
APPROVED BY : *T. Petchu.*  
NEXT CAL. DATE : 27/01/26

Calibrated by : Nithakorn Petchunai

Approved by : *T. Petchu.*  
( Thanakul Petchunai )

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.

## Result of calibration :

## 1. Absolute sensitivity

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

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
133

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

Frequency Weighting	Weighting (dB)
A-weight	9.9
C-weight	16.0
Flat	21.7

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.8	0.8	0.8	±1.5
1000	0.1	0.1	0.1	±1.0
8000	-2.6	-2.6	-2.6	±5.0

T. Petchu.

## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

## 9. Tone burst response

Time	Tone burst duration, T <sub>b</sub>	Cycle	Anticipated Value	Measured Value	Deviated Value	Acceptance Limits
Weighting	(ms)		(dB)	(dB)	(dB)	(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

## 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 Acoustic chamber and Reference Standard Instruments.

For tests results of each item 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-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY3320104	EEL-BP 210267	13-FEB-25
Digital Multimeter	33461A	MY3320076	EEL-BP 200267	15-FEB-25
Digital Multimeter	34461A	MY6000273	EEL-BP 220267	15-FEB-25
Programmable Amplifier	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	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 reusable to the international system of unit maintained at :

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

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-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	±3.0
Positive half cycle	133.4	135.2	+0.2	±2.0
Negative half cycle	133.4	135.2	+0.2	±2.0

## 11. Overload indication

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

T. Petchu.

## 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	0.3	0.6
125 Hz	0.3	0.6
1000 Hz	0.3	0.7
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings	0.3	0.6
For 10 Hz to 4 kHz	0.3	0.7
For > 4 kHz to 10 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

T. Petchu.

T. Petchu.

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	0.0	0.0	±2.0
125	-0.1	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	-0.1	0.0	0.0	±1.0
2000	0.0	0.1	0.1	±2.0
4000	0.0	0.1	0.1	±2.0
8000	0.0	0.1	0.1	±2.0

## 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	94.0	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
Long	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	94.1	0.1	±0.3

T. Petchu.

T. Petchu.



## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-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	108.0	0.0	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	108.1	0.1	1.5; -5.0
	200	800	127.6	127.7	0.1	±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	128.1	0.1	±1.0

## Calibration Procedure : CP-AC-61

## 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	MY48017016	EF-0099-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53270104	EEL-BP-210267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP-202067	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP-222067	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-42KAI	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).

## 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	0.0	0.0	0.1	±2.0
125	0.0	0.1	0.0	±1.5
250	0.0	0.1	0.0	±1.5
500	0.1	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.1	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

## 5. Frequency and time 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
Long	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	94.1	0.1	±0.3

## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±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	89.5	±1.5
Negative one-half cycle	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	±0.3

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

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NR-42 / Microphone UC-52 / Pre-amplifier NH-24  
Serial No.: 0855527 / 157781 / 48896  
ID No.: BKX, P30117

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 06 DECEMBER 2024  
Calibration Date : 13-16 DECEMBER 2024  
Date of Issue : 16 DECEMBER 2024

Calibrated by :

Nathorn Pitsumarn

Approved by :

T. Petchu-  
( Thanath Petchu )

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## Result of calibration :

## 1. Absolute sensitivity

Reference Acoustic Signal	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
93.9 (93.94)	93.9	0.0	±0.3

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
16.5

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

Frequency Weighting	Weighting (dB)
A-weight	13.1
C-weight	19.0
Flat	24.6

## 3. Acoustical signal tests of frequency weightings

Free field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.7	0.7	0.7	±1.5
1000	0.3	0.3	0.3	±1.0
8000	-0.6	-0.5	-0.5	±5.0

## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±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	134.1	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

Cert. No. : ACL24461  
Job No. : VCBAC0845  
Pages : 8 of 8Cert. No. : ACL25068  
Job No. : VCBAC0858  
Pages : 1 of 8

## 18. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leq,ak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±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	-0.1	±1.5
89.6	89.5	-0.1

## 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

Z. Petchu

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : EICM  
Model : TE-43 / Microphone UC-57 / Pre-amplifier XH-24  
Serial No.: 06072506 / 142140 / 22309  
ID No.: BEK, F50875

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATHANAKAN 40, PHATHANAKAN ROAD,  
KHWAENG PHATHANAKAN, KHEET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 07 JANUARY 2021  
Calibration Date : 21 - 23 JANUARY 2025  
Date of Issue : 24 JANUARY 2025

Calibrated by : Nisakorn Prompon

Approved by :

Z. Petchu  
( Thanakul Petchu )

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other than in full, except with the prior written approval of the head of Calibration Laboratory.

Cert. No. : ACL25068  
Job No. : VCBAC0858  
Pages : 3 of 8

## 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	0.25
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

Z. Petchu

Cert. No. : ACL25068  
Job No. : VCBAC0858  
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## Result of calibration :

## 1. Absolute sensitivity

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

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
15.8

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

Frequency Weighting	Weighting (dB)
A-weight	15.4
C-weight	21.7
Flat	27.2

## 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 Acceptance Limits
125	0.7 0.7 0.7 ±1.5
1000	0.2 0.2 0.2 ±1.0
8000	-0.1 -0.1 -0.1 ±3.0

Cert. No. : ACL25068  
Job No. : VCBAC0858  
Pages : 5 of 8

## 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	0.0 0.0 0.0 ±2.0
125	0.0 0.0 0.0 ±1.5
250	0.0 0.0 0.0 ±1.5
500	0.0 0.0 -0.1 ±1.5
1000	0.0 0.0 0.0 ±1.0
2000	0.0 0.0 0.0 ±2.0
4000	0.0 0.0 0.0 ±3.0
8000	0.0 0.1 0.1 ±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	94.0	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

Z. Petchu

Cert. No. : ACL25068  
Job No. : VCBAC0858  
Pages : 6 of 8

## 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	132.9	-0.1	±1.1
132.0	131.9	-0.1	±1.1
131.0	130.9	-0.1	±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	34.1	0.1	±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	26.2	0.2	±1.1
25.0	25.2	0.2	±1.1

Z. Petchu

Cert. No. : ACL25068  
Job No. : VCBAC0858  
Pages : 7 of 8

## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±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

Cert. No. : ACL25068  
Job No. : VCBAC0858  
Pages : 8 of 8

## 18. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leq,ak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±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	135.2	-0.2	±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	0.1	±1.5
89.5	89.6	0.1

## 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

Z. Petchu



## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-34  
Serial No.: 0672551 / 158776 / 58777  
ID No.: BKK\_FS0878

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHWAENG PHATTANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 19 DECEMBER 2024  
Calibration Date : 09 - 10 JANUARY 2025  
Date of Issue : 13 JANUARY 2025

Calibrated by : Natakorn Pongpauan

Approved by :

T. Petch  
(Thamkul Petchuni)

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other than in full, except with the prior written approval of the head of Calibration Laboratory.

Cert. No. : ACL25008  
Job No. : VCBAC0852  
Pages : 1 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 Acoustic 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	MY48917076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY53202742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-RP 210267	15-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-RP 200267	15-FEB-25
Digital Multimeter	34461A	MY60034273	EEL-RP 220267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977980	AA-1001-24	15-FEB-25
Measuring Amplifier	NA-42CAI	34564985	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).

Cert. No. : ACL25008  
Job No. : VCBAC0852  
Pages : 2 of 8

### 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
6000 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

Cert. No. : ACL25008  
Job No. : VCBAC0852  
Page : 4 of 8

### Result of calibration :

#### 1. Absolute sensitivity

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

#### 2. Self-generated noise

##### 2.1 Normal test

Measured Value (dB)
16.8

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

Frequency Weighting	Weighting (dB)
A-weight	11.6
C-weight	17.7
Flat	23.5

#### 3. Acoustical signal tests of frequency weightings

Meier free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.5
1000	0.2	0.2	0.2	± 1.0
8000	2.4	2.5	2.5	±5.0

Cert. No. : ACL25008  
Job No. : VCBAC0852  
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#### 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)			Acceptance Limits
	Flat	C-weight	A-weight	
63	-0.1	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±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	94.0	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
Log	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

Cert. No. : ACL25008  
Job No. : VCBAC0852  
Page : 6 of 8

#### 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	74.1	0.1	±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	34.1	0.1	±1.1
30.0	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	26.0	0.0	±1.1
25.0	24.9	-0.1	±1.1

Cert. No. : ACL25008  
Job No. : VCBAC0852  
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Cert. No. : ACL25008  
Job No. : VCBAC0852  
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#### 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-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	135.2	-0.2	±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	Negative one-half cycle		
89.5	89.4	-0.1	+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

40-40/1 Sathorn Road, Bangkok, Bangkok, 10100 Thailand  
Tel : +66 2423 8221 Email : cal@thipornlab.com

Cert. No. : ACL25008  
Job No. : VCBAC0852  
Page : 1 of 6

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-34  
Serial No.: 00672737 / 158772 / 58773  
ID No.: BKK\_FS0927

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHWAENG PHATTANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 07 JANUARY 2025  
Calibration Date : 21 - 23 JANUARY 2025  
Date of Issue : 24 JANUARY 2025

Calibrated by : Natakorn Pongpauan

Approved by :

T. Petch  
(Thamkul Petchuni)

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.

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

T. Petch

T. Petch

Cert. No. : ACL25069  
Job No. : VCMAC0958  
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 Acoustic chamber and Reference Standard Instruments.

For test results of each item were made by observations 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.	Exp. Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY5302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/02/07	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/02/07	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/02/07	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-42KAI	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).

Cert. No. : ACL25069  
Job No. : VCMAC0958  
Pages : 3 of 8

## 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

Cert. No. : ACL25069  
Job No. : VCMAC0958  
Page : 4 of 8

## 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

Measured Value (dB)
14.2

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

Frequency Weighting (dB)	Weighting (dB)
A-weight	10.8
C-weight	10.6
Flat	22.4

## 3. Acoustical signal tests of frequency weightings

Mean free-field acoustic response at a level of 94 dB

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.5	0.5	0.5	±1.5
1000	0.1	0.1	0.1	±1.0
8000	-1.4	-1.4	-1.4	±2.0

Cert. No. : ACL25069  
Job No. : VCMAC0958  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	-0.1	-0.1	±2.0
125	-0.1	0.0	-0.1	±1.5
250	-0.1	-0.1	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±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	94.0	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
Log	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	94.3	0.3	±0.3

Cert. No. : ACL25069  
Job No. : VCMAC0958  
Pages : 6 of 8

## 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
127.0	127.0	0.0	±1.1
136.0	136.0	0.0	±1.1
135.0	135.0	0.0	±1.1
134.0	134.1	0.1	±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	119.1	0.1	±1.1
114.0	114.1	0.1	±1.1
109.0	109.0	0.0	±1.1
104.0	104.1	0.1	±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	30.0	0.0	±1.1
29.0	28.8	-0.1	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	25.9	-0.1	±1.1
25.0	24.9	-0.1	±1.1

Cert. No. : ACL25069  
Job No. : VCMAC0958  
Pages : 7 of 8

## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-0.1	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, T <sub>b</sub> (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	2	1	108.0	108.0	0.0	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

Cert. No. : ACL25069  
Job No. : VCMAC0958  
Pages : 8 of 8

## 10. Peak C sound level

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	±3.0
Once	133.4	133.4	0.0	±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	133.4	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		
0.0	0.0	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

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INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
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AMPHIB BANGKOK 11500111, PHUKAN PHONG 11500111, PHUKAN PHONG 11500111  
TEL: 0800-2186-0801 FAX: 0800-2186-7140

**Certificate of Calibration**

Customer : ALS Laboratory Group Thailand Co., Ltd.  
Address : 134/1 Sri Phatthanasarn 40, Phatthanasarn Road, Sam Long, Bangkok 10220

Certificate No. : 22-SLM-0115  
Request No. : Req-2022-0803

Test Under Calibration Details  
Measurement Item : Sound Level Meter  
Manufacturer : B&K  
Model : 95-42  
Serial Number : 06672789  
ID : B&K\_F30039  
Resolution : 0.1 dB  
Instrument Status : Good

Calibration Environment and Details  
Temperature : 22 °C ± 2 °C  
Humidity : 26 %RH ± 20 %RH  
Reference Pressure : 93.94 Pa ± 10 Pa  
Reference Date : 19 March 2022  
Calibration Due : 19 March 2025  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3: 2013 Electroacoustics - Sound level meters - Part 3: Portable meter  
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Date calibration	Traceability
Standard Microphone	Brüel & Kjær	4182	2284802	23 June 2022	NIMT
Audio Generator	Swan	Sw601	131	17 October 2022	WK-Electro

Notes  
The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %.

Calibrated By : Mr. Nopadol Loongee  
Senior Calibration Engineer

Approved By : Mr. Pait Meekarn  
Calibration Engineer Supervisor

Issue Date : 19 March 2022

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TEL: 0800-2186-0801 FAX: 0800-2186-7140

**Certificate of Calibration**

Customer : ALS Laboratory Group Thailand Co., Ltd.  
Address : 134/1 Sri Phatthanasarn 40, Phatthanasarn Road, Sam Long, Bangkok 10220

Certificate No. : 22-SLM-0115  
Request No. : Req-2022-0803

Test Under Calibration Details  
Measurement Item : Sound Level Meter  
Manufacturer : B&K  
Model : 95-42  
Serial Number : 06672789  
ID : B&K\_F30039  
Resolution : 0.1 dB  
Instrument Status : Good

Calibration Environment and Details  
Temperature : 22 °C ± 2 °C  
Humidity : 26 %RH ± 20 %RH  
Reference Pressure : 93.94 Pa ± 10 Pa  
Reference Date : 19 March 2022  
Calibration Due : 19 March 2025  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3: 2013 Electroacoustics - Sound level meters - Part 3: Portable meter  
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Date calibration	Traceability
Standard Microphone	Brüel & Kjær	4182	2284802	23 June 2022	NIMT
Audio Generator	Swan	Sw601	131	17 October 2022	WK-Electro

Notes  
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Calibrated By : Mr. Nopadol Loongee  
Senior Calibration Engineer

Approved By : Mr. Pait Meekarn  
Calibration Engineer Supervisor

Issue Date : 19 March 2022

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Certificate No : 25-5130-113  
Request No : Req/2023-0603

### 5. Electrical signal test of frequency weightings. Weighting network response with relative to 1 kHz

UVC Setting	Deviation from various Frequency	UNCERTAINTY	Acceptance Limit	Result
FAST / 30-130	Weighting Response curve			
STD Setting	A (dB) C (dB) Z (dB)	(± 4dB)	(± 4dB)	
40 Hz	-0.1 0.1 0.0		± 0.2	Pass
125 Hz	0.0 0.1 0.1		± 0.2	Pass
250 Hz	0.0 0.1 0.1		± 0.2	Pass
500 Hz	0.0 0.1 0.1		± 0.2	Pass
1000 Hz	0.0 0.0 0.0		± 0.2	Pass
2000 Hz	-0.1 -0.1 -0.1		± 0.2	Pass
4000 Hz	-0.3 -0.3 -0.3		± 0.2	Pass
10000 Hz	0.0 0.0 0.0		± 0.2	Pass
16000 Hz	-1.0 -1.0 -1.0		± 0.2	Pass

### 6. Frequency and time weightings at 1 kHz

UVC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / 30-130	UVC	UVC ERR	(± 4dB)	(± 4dB)	
UVC Weighting	(dB)	(dB)			
A	114.00	114.0 0.0		± 0.2	Pass
C	114.00	114.0 0.0		± 0.2	Pass
Z	114.00	114.0 0.0		± 0.2	Pass

UVC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit	Result
30-130 / A	UVC	UVC ERR	(± 4dB)	(± 4dB)	
UVC Time Response	(dB)	(dB)			
Fast	114.00	114.0 0.0		± 0.2	Pass
Slow	114.00	114.0 0.0		± 0.2	Pass
Imp	114.00	114.0 0.0		± 0.2	Pass

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Certificate No : 25-5130-113  
Request No : Req/2023-0603

UVC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	UVC	(± 4dB)	(± 4dB)	
STD Setting	(dB)			
Initial	114.0			
Final	114.0			
Deviation	0.0	0.10	0.30	Pass

### 8. Level linearity on the reference level range

UVC Setting	Assigned	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	REF	UVC	ERR	(± 4dB)	(± 4dB)
STD Setting	(dB)	(dB)	(dB)		
130.00	130	130.0 0.0		± 0.2	Pass
124.00	124	124.0 0.0		± 0.2	Pass
120.00	120	120.0 0.0		± 0.2	Pass
116.00	116	116.0 0.0		± 0.2	Pass
112.00	112	112.0 0.0		± 0.2	Pass
108.00	108	108.0 0.0		± 0.2	Pass
104.00	104	104.0 0.0		± 0.2	Pass
100.00	100	100.0 0.0		± 0.2	Pass
96.00	96	96.0 0.0		± 0.2	Pass
92.00	92	92.0 0.0		± 0.2	Pass
88.00	88	88.0 0.0		± 0.2	Pass
84.00	84	84.0 0.0		± 0.2	Pass
80.00	80	80.0 0.0		± 0.2	Pass
76.00	76	76.0 0.0		± 0.2	Pass
72.00	72	72.0 0.0		± 0.2	Pass
68.00	68	68.0 0.0		± 0.2	Pass
64.00	64	64.0 0.0		± 0.2	Pass
60.00	60	60.0 0.0		± 0.2	Pass
56.00	56	56.0 0.0		± 0.2	Pass
52.00	52	52.0 0.0		± 0.2	Pass
48.00	48	48.0 0.0		± 0.2	Pass
44.00	44	44.0 0.0		± 0.2	Pass
40.00	40	40.0 0.0		± 0.2	Pass
36.00	36	36.0 0.0		± 0.2	Pass
32.00	32	32.0 0.0		± 0.2	Pass
28.00	28	28.0 0.0		± 0.2	Pass
24.00	24	24.0 0.0		± 0.2	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuance Instrument Co., Ltd.

INNOVATIVE-ISO 9001:2015

Certificate No : 25-5130-113  
Request No : Req/2023-0603

### 9. Level linearity including the level range control

UVC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A	REF	UVC	ERR	(± 4dB)	(± 4dB)
UVC Range	(dB)	(dB)	(dB)		
30-130	29.20	29.4 0.1		± 0.2	Pass
	134	134.0 0.0		± 0.2	Pass

### 10. Tone burst response

UVC Setting	STD	Assigned	Measured	UNCERTAINTY	Acceptance Limit	Result
A / 30-130	Timeburst	Ref	UVC	ERR	(± 4dB)	(± 4dB)
UVC Time Response	(sec)	(dB)	(dB)	(dB)		
Fast	200	126.0	126.0 0.0		± 0.2	Pass
	2	109.0	109.0 0.0		± 0.2	Pass
	0.25	100.0	100.0 0.0		± 0.2	Pass
Slow	200	119.4	119.4 0.0		± 0.2	Pass
	2	100.0	100.0 0.0		± 0.2	Pass
	200	126.0	126.0 0.0		± 0.2	Pass
SEL	2	100.0	100.0 0.0		± 0.2	Pass
	0.25	91.0	91.0 -0.1		± 0.2	Pass

### 11. Peak C Sound level

UVC Setting	Assigned	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / C / 25-141	REF	UVC	ERR	(± 4dB)	(± 4dB)
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	134.4	134.2 -0.2		± 0.2	Pass
Positive half cycle	135.4	135.1 -0.3		± 0.2	Pass
Negative half cycle	135.4	135.1 -0.3		± 0.2	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuance Instrument Co., Ltd.

INNOVATIVE-ISO 9001:2015

Certificate No : 25-5130-113  
Request No : Req/2023-0603

UVC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	UVC	(± 4dB)	(± 4dB)	
STD Setting	(dB)			
Positive half cycle	139.2			
Negative half cycle	139.1			
Deviation	0.1	0.20	1.5	Pass

### 13. High Level Stability

UVC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 30-130	UVC	(± 4dB)	(± 4dB)	
STD Setting	(dB)			
Initial	129.0			
Final	129.0			
Deviation	0.0	0.16	0.30	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
1. Indication at the calibration check frequency	Not applicable
2. Self-generated noise, Microphone installed	Not applicable
3. Self-generated noise, Microphone replaced by the electrical input signal device	Not applicable
4. Acoustic signal test of frequency weightings at 100 Hz to 1 kHz	± 0.05 dB
5. Acoustic signal test of frequency weightings at 1 kHz to 10 kHz	± 0.70 dB
6. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	± 0.20 dB
7. Frequency and time weightings at 1 kHz	± 0.20 dB
8. Long Term Stability	± 0.10 dB
9. Level linearity on the reference level range	± 0.30 dB
10. Level linearity including the level range control	± 0.30 dB
11. Tone burst response	± 0.30 dB
12. Overload indication	± 0.25 dB
13. High Level Stability	± 0.10 dB

Acceptance Limit and Maximum-permitted Uncertainty see: IEC 61672-1:2002

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuance Instrument Co., Ltd.

INNOVATIVE-ISO 9001:2015

Certificate No : 25-5130-113  
Request No : Req/2023-0603

### Decision Rule for Statements of Conformity

The standard decision rule employed for the statement of conformity to each calibration result will be applied using ISAC-02:08 (2019), Guidelines on the

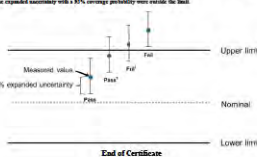
Expressing of Compliance with Specification in a following Fig and continues

Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability was within the limit.

Fail - The measurement result was not within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Pass - The measurement result was not within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability was outside the limit.



End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuance Instrument Co., Ltd.

INNOVATIVE-ISO 9001:2015

## SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

407-40/51 Sathorn Road, Bangkok, Bangkok, 10120 Thailand  
Tel: +66 2402 8020 Email: cal@calibrationlab.co.th



Cert. No : ACF 740801  
Pages : 1 of 8

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NE-42 / Microphone UC-52 / Preamp/Filter NH-34  
Serial No.: 0083819 / 137785 / 48094  
ID No.: RKK\_FS1009

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTANAKAN 40, PHATTANAKAN ROAD,  
KHUWAENG PHATTANAKAN, KHUET SUAN LIANG,  
BANGKOK, 10250 THAILAND.

Location : ~  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %  
Received Date : 14 JANUARY 2025  
Calibration Date : 27-29 JANUARY 2025  
Date of Issue : 30 JANUARY 2025

REVIEW BY: *Thana P.*  
APPROVED BY: *[Signature]*  
NEXT CAL DATE: 27/01/26

Calibrated by : Nattakorn Pongpattana

Approved by : *[Signature]*  
( Thana Pongpattana )

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.



SITHIPORN ASSOCIATES  
CALIBRATION LABORATORY

Cert. No. : ACL25093  
Job No. : YC8AC0863  
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 Acoustic chamber and Reference Standards.  
For tests results of each item 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-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/0267	13-FEB-25
Digital Multimeter	34461A	MY56024273	EEL-BP 22/0267	13-FEB-25
Programmable Attenuator	MAAT-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).



SITHIPORN ASSOCIATES  
CALIBRATION LABORATORY

Cert. No. : ACL25093  
Job No. : YC8AC0863  
Pages : 3 of 8

### 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

### Result of calibration :

## 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	-0.1	0.0	0.0	±2.0
125	0.0	0.0	-0.1	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±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	94.0	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

T. Petch

## 7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
117.0	117.0	0.0	±1.3
126.0	126.0	0.0	±1.3
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
128.0	128.0	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	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	26.0	0.0	±1.1
25.0	25.0	0.0	±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)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±1.1

## 9. Tone burst response

Time Weighting	Tone burst duration, T <sub>b</sub> (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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## 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
Cut	133.4	133.4	0.0	±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	135.2	-0.2	±2.0
Negative half cycle	133.4	135.2	-0.2	±2.0

## 11. Overload indication

Measured value ( dB )		Deviated Value ( dB )	Acceptance Limits ( dB )
Positive one-half cycle	Negative one-half cycle		
89.6	89.5	-0.1	±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 calibration, providing a level of confidence of approximately 95 %

End of Calibration Certificate

T. Petch

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42 / Microphone UC-52 / Pre-amplifier NH-24  
Serial No.: 00838520 / 158771 / 58772  
ID No.: BUCK\_F80110

Condition As Found : GOOD  
Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
184 PHATTHANAKAN-40, PHATTHANAKAN ROAD,  
KIWAENG PHATTHANAKAN, KIET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 06 DECEMBER 2024  
Calibration Date : 13-16 DECEMBER 2024  
Date of Issue : 16 DECEMBER 2024

Calibrated by : Nithakorn Petchum

Approved by : T. Petch  
( Tharakul Petchum )

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.

## Calibration Procedure : CP-AC-01

## Calibration Method :

This equipment was calibrated by follow on ISO-61672-3 (2013) Standard for sound level meter (SLM).  
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with A-weighting 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	5523BA	MY6001975	EP-0099-24	09-FEB-25
Waveform Generator	25511B	MY5230742	EP-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 210267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 200367	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 220267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EP-0008-24	05-FEB-25
Condenser Microphone	4180	2977600	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	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).

T. Petch

## 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

T. Petch

## Result of calibration :

## 1. Absolute sensitivity

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

## 2. Self-generated noise

## 2.1 Normal test

Measured Value (dB)
14.8

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

Frequency Weighting	Weighting (dB)
A-weight	10.8
C-weight	16.9
Flat	22.6

## 3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)
125	0.3
1000	0.2
8000	-0.7

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## 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	0.0	0.0	0.0	±2.0
125	0.0	0.0	0.1	±1.5
250	0.1	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±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	94.0	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	94.1	0.1	±0.3

T. Petch



**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

419-4191 Sirithorn Road, Bangkum, Bangkok, 10700 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24400  
Job No. : YC8AC0045  
Pages : 6 of 8

**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	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	26.0	0.0	±1.1
25.0	25.1	0.1	±1.1

*T. Petch*

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

419-4191 Sirithorn Road, Bangkum, Bangkok, 10700 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24400  
Job No. : YC8AC0045  
Pages : 7 of 8

**8. Level linearity including the level range control**

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	84.0	84.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±1.1

**9. Tone burst response**

Time	Tone burst duration, Th (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	128.1	0.1	±1.0

*T. Petch*

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

419-4191 Sirithorn Road, Bangkum, Bangkok, 10700 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24400  
Job No. : YC8AC0045  
Pages : 8 of 8

**10. Peak sound level**

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leq (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±1.0
One	133.4	133.4	0.0	±1.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	132.9	-0.1	±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		
89.5	89.6	0.1	±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

*T. Petch*

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

419-4191 Sirithorn Road, Bangkum, Bangkok, 10700 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24356  
Page : 1 of 3

**Calibration Certificate**

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-43 / Microphone UC-52 / Pre-amplifier NH-24  
Serial No. : 06597166 / 140809 / 10179  
ID No. : BCKL\_P81001

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHUWAENG PHATTHANAKAN, KHUET SUAN LUANG,  
BANGKOK, 10250 THAILAND.

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

Received Date : 05 NOVEMBER 2024  
Calibration Date : 14-18 NOVEMBER 2024  
Date of Issue : 18 NOVEMBER 2024

Calibrated by : Nithakorn Pitsutumn

Approved by : *T. Petch*  
(Thakul Petchum)

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

*T. Petch*

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

419-4191 Sirithorn Road, Bangkum, Bangkok, 10700 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24356  
Job No. : YC8AC0029  
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 into to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For test results of each item 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	13510A	MY48017616	EP-0009-24	05-FEB-25
Waveform Generator	32511B	MY52302742	EP-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53270104	EEL_BP 210267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL_BP 202667	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL_BP 220267	15-FEB-25
Programmable Attenuator	MAF-1070	62100114	EP-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KA	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 :

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

*T. Petch*

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

419-4191 Sirithorn Road, Bangkum, Bangkok, 10700 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24356  
Job No. : YC8AC0029  
Page : 4 of 8

**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)
14.8

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

Frequency Weighting	Weighting (dB)
A-weight	11.6
C-weight	17.2
Flat	23.1

**3. Acoustical signal tests of frequency weightings**

Meter free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)	Acceptance Limits (dB)
125	6.1	±1.5
1000	6.1	±1.0
8000	1.5	±5.0

*T. Petch*

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

419-4191 Sirithorn Road, Bangkum, Bangkok, 10700 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24356  
Job No. : YC8AC0029  
Pages : 5 of 8

**4. Electrical signal tests of frequency weightings**

Weighting network response with relative to 1 kHz

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	-0.1	-0.1	-0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.0	±5.0

**5. Frequency and time 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
Log	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

*T. Petch*

**SITHIPORN ASSOCIATES CO., LTD.**  
**CALIBRATION LABORATORY**

419-4191 Sirithorn Road, Bangkum, Bangkok, 10700 Thailand  
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24356  
Job No. : YC8AC0029  
Pages : 6 of 8

**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	135.1	0.1	±1.1
134.0	134.1	0.1	±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	119.1	0.1	±1.1
114.0	114.1	0.1	±1.1
109.0	109.0	0.0	±1.1
104.0	104.1	0.1	±1.1
99.0	99.1	0.1	±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	29.2	0.2	±1.1
28.0	28.2	0.2	±1.1
27.0	27.2	0.2	±1.1
26.0	26.2	0.2	±1.1
25.0	25.3	0.3	±1.1

*T. Petch*

#### 8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits
130	29.0	29.1	0.1	±1.1

#### 9. Tone burst response

Time Weighting	Tone burst duration, T <sub>b</sub> (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	116.9	-0.1	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	98.8	-0.2	1.5; -5.0
SEL	2	8	108.0	107.9	-0.1	1.0; -2.5
	200	800	128.0	128.0	0.0	±1.0

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

#### 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 item 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-0009-24	05-FEB-25
Waveform Generator	33511B	MY53202742	TD-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53200164	EEL-RP 2140267	13-FEB-25
Digital Multimeter	33461A	MY53200076	EEL-RP 2000267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-RP 2240267	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-42KAI	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 result is traceable to the international system of unit maintained at :

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

End of Calibration Certificate

#### 10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L <sub>peak</sub> (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±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	89.5	0.0
Negative one-half cycle	89.5	0.0

#### 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

#### 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 1 kHz	0.2	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

#### 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	0.0	0.0	0.1	±2.0
125	0.0	0.0	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±5.0

#### 5. Frequency and time 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

End of Calibration Certificate

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-02 / Microphone UC-52 / Pre-amplifier NH-34  
Serial No. : 00838521 / 158765 / 58767  
ID No. : BOK F30111

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATHANAKAN-40, PHATHANAKAN ROAD,  
KIWAENG PHATHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10259 THAILAND

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

Received Date : 07 JANUARY 2025  
Calibration Date : 21 - 23 JANUARY 2025  
Date of Issue : 24 JANUARY 2025

Calibrated by : Natchanon Pinitponn

Approved by :  
( Thanakul Petchuni )

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.

#### 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)
14.2

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

Frequency Weighting	Weighting (dB)
A-weight	10.8
C-weight	17.4
Flat	21.0

##### 3. Acoustical signal tests of frequency weightings

Mean free-field acoustic response at a level of 94 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			Acceptance Limits
	Flat	C-weight	A-weight	
125	0.6	0.6	0.6	±1.5
1000	0.1	0.1	0.1	±1.0
8000	-1.9	-1.9	-1.9	±5.0

End of Calibration Certificate

End of Calibration Certificate



18. Peak C sound level  
Cert. No. : ACL25066  
Job No. : VCMAC0858  
Pages : 8 of 8

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Leqpk (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-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	135.2	-0.2	±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	89.5	±1.5
Negative one-half cycle	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	±0.3

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

T. Petchu

Cert. No. : ACL24417  
Job No. : VCMAC0859  
Pages : 3 of 8

## 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	0.2	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

T. Petchu

Cert. No. : ACL24417  
Job No. : VCMAC0859  
Pages : 6 of 8

## 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	30.0	0.0	±1.1
29.0	29.0	0.0	±1.1
28.0	28.0	0.0	±1.1
27.0	27.0	0.0	±1.1
26.0	26.1	0.1	±1.1
25.0	25.1	0.1	±1.1

T. Petchu

Cert. No. : ACL24417  
Job No. : VCMAC0859  
Pages : 7 of 8

## 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

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	28.9	-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	134.1	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

T. Petchu

## Calibration Certificate

Equipment : SOUND LEVEL METER  
Manufacturer : RION  
Model : NL-42A / Microphone UC-51 / Preamplifier NH-14  
Serial No. : 0022514 / 195823 / 13346  
ID No. : RKK FS1226

Condition As Found : GOOD

Customer : ALS LABORATORY GROUP (THAILAND) CO., LTD.  
104 PHATTHANAKAN 40, PHATTHANAKAN ROAD,  
KHWAENG PHATTHANAKAN, KHET SUAN LUANG,  
BANGKOK, 10250 THAILAND.Location :  
Ambient Temperature : ( 23.0 ± 3 ) °C  
Pressure : ( 101.3 ± 3 ) kPa  
Relative Humidity : ( 50.0 ± 20 ) %Received Date : 12 DECEMBER 2024  
Calibration Date : 21-24 DECEMBER 2024  
Date of Issue : 26 DECEMBER 2024

Calibrated by : Nitaborn Pongpoo

Approved by :

REVIEW BY : T. Petchu  
APPROVED BY :  
NEXT CAL DATE : 23/12/25

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.

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 in Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference  
Standard Instruments.

For test results of each item were made by observation of each instruments display and also with SLM's display.

## Condition of this result of calibration :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52307242	EF-0007-24	05-FEB-25
Digital Multimeter	33941A	MY53220194	EEL-RP-21/0267	13-FEB-25
Digital Multimeter	33941A	MY53220076	EEL-RP-20/0267	13-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-RP-22/0267	15-FEB-25
Programmable Attenuator	MA1-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977000	AA-1001-24	13-FEB-25
Measuring Amplifier	NA-42KAJ	34560495	AA-1001-24	05-FEB-25

3. This result of calibration was issued 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).

Cert. No. : ACL24417  
Job No. : VCMAC0859  
Pages : 5 of 8

## 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.1	0.1	0.0	±1.5
250	0.0	0.0	0.0	±1.5
500	0.0	0.1	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.1	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.1	0.1	±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	94.0	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

T. Petchu

Cert. No. : ACL24417  
Job No. : VCMAC0859  
Pages : 8 of 8

## 18. Peak C sound level

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

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	132.9	-0.1	±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	89.5	±1.5
Negative one-half cycle	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	±0.3

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

T. Petchu



### Certificate of Calibration

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
Name: 104 Soi Phatthanasak 49, Phatthanasak Road, Sam Luang, Bangkok 10250  
Request No.: Rq-2023-008

Unit Under Calibration Details  
Measurement Item: Air Flow Meter  
Manufacturer: Minox Lab  
Model: 200-5104  
Serial Number: 15114  
ID: BKC 150614  
Location of Calibration: LAB 4 AIR VELOCITY METER  
Calibration Environment and Details  
Temperature: 22.7 °C ± 0.2 °C  
Humidity: 55.94% ± 2.00% RH  
Reference Pressure: 1013.25 hPa ± 0.05 hPa  
Received Date: 3 September 2023  
Calibration Date: 10 September 2023  
Calibration Procedure: Reference method CP-33M-01 by Comparative technique with Standard Primary Flow Calibration

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Calibrator 3 Low Flow	1851010006	Secondary	5 May 2024
Air Flow Meter	Calibrator 3 Standard Flow	1851010103	Secondary	6 May 2024
Temperature sensor	QT 11	00000017	Quartz	15 October 2023
Pressure sensor	CP22400	40000000/401000	TGA	21 October 2023

Traceability: This Certificate is traceable to SI Unit through Secondary A.S.A. Accreditation No. 2943-01 and MET NIST-TIS-TIS Accreditation No. 0072.  
Note: The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95%.

Calibration By: Mr. Nopphadol Luangsom  
Approved By: Mr. Pait Mahasoms  
Calibration Engineer Supervisor  
Issue Date: 10 September 2023

### Certificate of Calibration

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
Name: 104 Soi Phatthanasak 49, Phatthanasak Road, Sam Luang, Bangkok 10250  
Request No.: Rq-2023-008

STD Reading				UUC Reading				Error		Uncertainty	
Temperature (°C)	Pressure (kPa)	Flow (m³/min)	Flow (m³/min)	Temperature (°C)	Pressure (kPa)	Flow (m³/min)	Flow (m³/min)	(m³/min)	(°C)	(kPa)	(m³/min)
22.5	100.99	100	-	-	100.92	0.0	3.0	1.0	0.50		
22.7	100.97	500	-	-	100.91	-12	9.3	1.0	0.50		
22.8	100.99	1000	-	-	100.94	-3	19	1.0	0.50		
26.1	100.96	2000	-	-	200.9	2	30	1.0	0.50		
26.5	100.95	3000	-	-	300.8	-12	47	1.0	0.50		
26.7	100.91	4000	-	-	400.0	-20	70	1.0	0.50		
27.8	100.74	5000	-	-	500.8	-46	95	1.0	0.50		

Note: STD - Standard UUC - Unit Under Calibration  
- UUC Reference Condition: At atmospheric pressure and room temperature condition, Air  
- Flow Rate was corrected for non-standard operating condition by using equation:  
$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$
  
where: Q = Flow Rate P = Absolute Pressure T = Absolute Temperature  
meas = Measurement Condition ref = Standard Condition  
\* Calibration not successful

End of Certificate

### Certificate of Calibration

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
Name: 104 Soi Phatthanasak 49, Phatthanasak Road, Sam Luang, Bangkok 10250  
Request No.: Rq-2023-007

Unit Under Calibration Details  
Measurement Item: Air Flow Meter  
Manufacturer: Minox Lab  
Model: 200-5104  
Serial Number: 150614  
ID: BKC 150614  
Location of Calibration: LAB 4 AIR VELOCITY METER  
Calibration Environment and Details  
Temperature: 22.7 °C ± 0.2 °C  
Humidity: 55.94% ± 2.00% RH  
Reference Pressure: 1013.25 hPa ± 0.05 hPa  
Received Date: 3 September 2023  
Calibration Date: 10 September 2023  
Calibration Procedure: Reference method CP-33M-01 by Comparative technique with Standard Primary Flow Calibration

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Calibrator 3 Low Flow	1851010006	Secondary	5 May 2024
Air Flow Meter	Calibrator 3 Standard Flow	1851010103	Secondary	6 May 2024
Temperature sensor	QT 11	00000017	Quartz	15 October 2023
Pressure sensor	CP22400	40000000/401000	TGA	21 October 2023

Traceability: This Certificate is traceable to SI Unit through Secondary A.S.A. Accreditation No. 2943-01 and MET NIST-TIS-TIS Accreditation No. 0072.  
Note: The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95%.

Calibration By: Mr. Nopphadol Luangsom  
Approved By: Mr. Pait Mahasoms  
Calibration Engineer Supervisor  
Issue Date: 10 September 2023

The results stated only for the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuance Instrument Co., Ltd.  
ISO 9001:2015 8.5.3 Nonconforming Output Control

The results stated only for the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuance Instrument Co., Ltd.  
ISO 9001:2015 8.5.3 Nonconforming Output Control

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
1130 MOO 13, SOI KUNTHAYAMIN 11, THAMMONGKOLKANG  
AMPHUR BANGKOK PRAKIN PROVINCE 10140 THAILAND  
TEL: 0809 2119 5981 FAX: 0809 2119 7506

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ANAB  
Page 3/2

Certificate No.: 25CH0337  
Request No.: Rq-2023-007

Result of Calibration: Without Adjustment

STD Reading				UUC Reading				Error		Uncertainty	
Temperature (°C)	Pressure (kPa)	Flow (m³/min)	Flow (m³/min)	Temperature (°C)	Pressure (kPa)	Flow (m³/min)	Flow (m³/min)	(m³/min)	(°C)	(kPa)	(m³/min)
25.2	100.98	20	-	-	204.63	0.0	1.0	1.0	0.50		
25.4	100.96	70	-	-	100.91	-0.1	4.0	1.0	0.50		
25.5	100.91	140	-	-	100.89	0.1	5.6	1.0	0.50		
25.6	100.86	170	-	-	100.84	0.3	5.6	1.0	0.50		
25.6	100.81	190	-	-	200.77	1.2	5.2	1.0	0.50		
25.6	100.85	207	-	-	100.80	-1	11	1.0	0.50		
26.7	100.86	862	-	-	801.85	-1	14	1.0	0.50		
26.7	100.87	230	-	-	200.26	-1	19	1.0	0.50		

Note: STD - Standard UUC - Unit Under Calibration  
- UUC Reference Condition: At atmospheric pressure and room temperature condition, Air  
- Flow Rate was corrected for non-standard operating condition by using equation:  
$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$
  
where: Q = Flow Rate P = Absolute Pressure T = Absolute Temperature  
meas = Measurement Condition ref = Standard Condition  
\* Calibration not successful

End of Certificate

The results stated only for the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Issuance Instrument Co., Ltd.  
ISO 9001:2015 8.5.3 Nonconforming Output Control

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
354/4 PHATTHANASAK ROAD SOI 10, SUKUMVIT, SUKUMVIT 10, BANGKOK 10250  
TEL: 02-2717-3000-29 FAX: 02-2718-9484

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Page 3/2

Certificate of Calibration  
Cert. No.: 25CH0337  
Page: 1 of 3

Equipment:  
Manufacturer: HACH  
Model: DR3900  
Serial No.: 2021559  
ID No.: BKK\_EL0037  
Condition As-Received:  
Received Date: 08 October 2023  
Calibration Date: 08 October 2023  
Reference: 2510-00420C-11  
Submitted by: ALS Laboratory Group (Thailand) Co. Ltd.  
104 Phatthanasak Rd., Phatthanasak Rd.,  
Khaewang Phatthanasak, Khat Sam Luang,  
Bangkok 10250 Thailand  
Wet Chemistry Lab 2  
(21.9 to 21.9) °C (On-Site)  
(62 to 66) % (On-Site)  
In-house method:  
CP-0014 based on ASTM E 275-08

Calibration Place:  
Ambient Temperature:  
Relative Humidity:  
Calibration Procedure:  
Calibrated by: Uthair Kankam  
Approved by: Sathap  
( ) Chakrit Watanwan  
( ) Porpan Pajin  
( ) Sathap Meangmei  
Issue Date: 9 October 2023

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

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Page 3/2

Cert. No.: 25CH0337  
Page: 2 of 3

Condition of calibration result

1. Reference Standard Material:

Material	Serial No.	Certificate No.	Due date
1. Absorbance Standard set	44467	322594	31 May 2026
2. Wavelength Standard set	36730	118120	15 Jan 2026
3. Wavelength Standard set	36730	118121	15 Jan 2026

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

3. This certificate is traceable to the International System of Unit maintained through:  
- Sigma Scientific Ltd.

4. Spectral Bandwidth: 5 nm  
Scan Speed: 100 nm/min

Calibration Results: without adjustment

Wavelength Accuracy

Reference Material	UUC Reading	Uncertainty of Measurement	Coverage Factor
(nm)	(nm)	(nm)	k
416.40	416	0.59	2.00
479.88	480	0.59	2.00
513.75	513	0.59	2.00
537.00	536	0.59	2.00
636.00	636	0.59	2.00
747.81	748	0.59	2.00
807.94	807	0.59	2.00

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Page 3/2

Cert. No.: 25CH0337  
Page: 3 of 3

Calibration Results: without adjustment

Photometric Accuracy

Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading	Uncertainty of Measurement (Abs)	Coverage Factor k
420.0	Zero	0.000	0.0028	2.00
	0.5750	0.573	0.0028	2.00
	0.7156	0.713	0.0028	2.00
	1.0176	1.014	0.0028	2.00
440.0	Zero	0.000	0.0028	2.00
	0.5598	0.557	0.0028	2.00
	0.7037	0.700	0.0028	2.00
	1.0013	0.997	0.0028	2.00
465.0	Zero	0.000	0.0028	2.00
	0.5222	0.522	0.0028	2.00
	0.6646	0.664	0.0028	2.00
	0.9444	0.945	0.0028	2.00
546.1	Zero	0.000	0.0028	2.00
	0.5234	0.523	0.0028	2.00
	0.7007	0.700	0.0028	2.00
	0.9992	0.999	0.0028	2.00
590.0	Zero	0.000	0.0028	2.00
	0.5573	0.556	0.0028	2.00
	0.7760	0.773	0.0028	2.00
	1.1104	1.108	0.0028	2.00
635.0	Zero	0.000	0.0028	2.00
	0.5648	0.565	0.0028	2.00
	0.7654	0.765	0.0028	2.00
	1.0961	1.096	0.0028	2.00

Remark:  
- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer  
- UUC = Unit Under Calibration  
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.

Agilent Technologies

Customer Contact  
ALS Laboratory Group (Thailand) Co. Ltd. Head Office  
104 Phatthanasak Rd. Phatthanasak Rd. Thung Phatthanasak Khat Sam Luang 10250 THAILAND  
Chaturaporn.Jachon@agilent.com  
2780388  
Invoice To: ALS Laboratory Group (Thailand) Co. Ltd. Head Office  
104 Phatthanasak Rd. Phatthanasak Rd. Thung Phatthanasak Khat Sam Luang 10250 THAILAND  
104 Phatthanasak Rd. Phatthanasak Rd. Thung Phatthanasak Khat Sam Luang 10250 THAILAND  
Location: Room B14 Lab Dept  
Delivery Site: ALS Laboratory Group (Thailand) Co. Ltd. Head Office  
104 Phatthanasak Rd. Phatthanasak Rd. Thung Phatthanasak Khat Sam Luang 10250 THAILAND  
Location: Room B14 Lab Dept

Service Report  
Customer Purchase Order Number: 70371015  
Customer Number: 70371015  
Service Request: Service Request Date:  
Service Order: 10167001  
Service Confirmation: 88881112

Direct Inquiry to: Contact Name: Customer Contact Email: 10167001  
Contact Email: 10167001  
Contact Telephone: 442 821 8388  
Contact Fax: 442 821 8338

Direct Inquiry to: Contact Name: Customer Contact Email: 10167001  
Contact Email: 10167001  
Contact Telephone: 442 821 8388  
Contact Fax: 442 821 8338

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a range of laboratory and analytical solutions for your  
applications and workflows. Visit us at [www.agilent.com/service](http://www.agilent.com/service)

Service Confirmation Number: 89987813  
Service Confirmation Date: 23.05.2024

Service Instrument

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYG-4100	ICP-OES 5100/5110 System			
68010A	Agilent 5100 SVDV ICP-OES Spectrometer	MY1001000	ICP OES 5100	SYG-4100
68010A	SPS-A Assemblable	A01544754	ICP OES 5100	SYG-4100

Service Items:

Item	Service/Part #	Description	Qty	Estimate	Service Start	Service End
1009	1502	Enterprise Operational Qualification	1.00	Agreement, Endowment - 100 % covered	22.03.2024	23.05.2024
1010	681005100	Service ICP OES Wavelengths 5100, 5 ppm	1.00	Agreement, Endowment - 100 % covered		
1029	5100-7001	Calibration blank solution Spect-PN03	1.00	Agreement, Endowment - 100 % covered		

Additional Information:



<b>Service Information:</b>		
<b>Parking Description:</b> WJ CG CG 10-19-202121460		
<b>Service Provided:</b> Complete GDSW O'ROCKETS Equipment ID: ORG_119037, all test passed		
<b>Service Overview Code:</b> Reason Code: Scheduled Service Diagnostic Code: Scheduled Service Resolution Code: Scheduled Service		
<b>Reported Issue:</b>	<b>Travel History:</b>	
I.D.	I.D.	
<b>Customer Field Service Representative Name:</b> Benson, Debbie	<b>Customer Field Service Representative Signature:</b> 	<b>Date:</b> 22 Sep 2024
<b>Customer Name:</b> SOMMATHURAI SACHIN	<b>Customer Signature:</b> 	<b>Date:</b> 22 Sep 2024
<b>Additional Comments:</b>		

NEXT CAL: DATE



**Bara Scientific**

## Certificate of Calibration

**Shimadzu LC-HIC**

This certificate is to verify that instrument below are calibrated

by Bara Scientific Co., Ltd

Instrument	Serial No.
DGU-403	L2116050657
SIL-20AC	L20176012374
CTD-405	L22236003442
LC-20ADSP	L20106096217
SPD-40	L22256002616
CDD-10Aup	C21346004484
CBM-40Iite	L22126103139

**For**

**ALS Laboratory Group (Thailand) Co., Ltd.**

*Penyedia*

Operator Signature: \_\_\_\_\_

Date: 21 November 2024

**(Mr.Thanethai Toros)**

Service Engineer




**SHIMADZU**  
Pioneer in Science

Bara Scientific Co., Ltd.

11 Chai Leng Building (Floor 7) - 999, Jalan 1001, Jalan Raya Bangsar Bangsar (1000)

Thailand 101 101-010101 (Bangkok) Tel: 02-01979981 www.barascientific.com

**Calibration Co. Ltd**  
 Unit 10, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 83



JIRANATE ASSOCIATES CO. LTD.

Certification of Calibration Number COT-113-08

Page 2 of 2 Pages

**Result of Calibration:** ☒ Without Adjustment ☐ With Adjustment

**Calibration Range:** 20 °C to 40 °C

**Function:**

Table 1: This equipment was connected with wet bulb probe Model: HP2201.2, S/N: Z2033256.  
Dimension: Diameter 3.1 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.045	19.9	-0.1	0.09
80	25.045	24.9	-0.1	0.09
80	30.044	29.9	-0.1	0.09
80	35.039	34.9	-0.1	0.09
80	40.024	39.9	-0.1	0.09

Table 2: This equipment was connected with Globe thermometer probe Model: TP2201.2, S/N: Z2033463.  
Dimension: Diameter 3.1 mm, Length 220 mm.


Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.045	20.0	0.0	0.09
110	25.049	25.0	0.0	0.09
110	30.054	30.0	0.0	0.09
110	35.053	35.0	0.0	0.09
110	40.066	40.1	0.1	0.09

Table 3: This equipment was connected with temperature probe Model: TP2207.2, S/N: 15037318.  
Dimension: Diameter 14 mm, Length 150 mm.


Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.050	20.3	0.3	0.09
75	25.050	25.0	-0.1	0.09
75	30.054	29.9	-0.2	0.09
75	35.039	34.7	-0.3	0.09
75	40.066	39.6	-0.4	0.09

(JNAC) Temperature Calibration

\*\*\*End of Certificate of Calibration\*\*\*



[illegible]



JIRANATE ASSOCIATES CO., LTD.

Continuation of Certificate of Calibration Number CDT-007-08

Page 2 of 3 Pages

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

**Uncertainties**

Table 1: This equipment was connected with wet bulb probe Model HP202.1, 5/N: 15105466.

Dimensions: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.037	20.1	0.0	0.009
80	23.046	23.1	0.0	0.009
80	30.016	30.1	0.0	0.009
80	35.019	35.1	0.0	0.009
80	40.002	40.1	0.1	0.009

Table 2: This equipment was connected with Global thermometer probe Model HP202.2, 5/N: 15105972.

Dimensions: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.037	20.0	-0.1	0.009
110	23.046	23.0	0.0	0.009
110	30.006	30.0	0.0	0.009
110	35.019	35.0	0.0	0.009
110	40.002	40.0	0.0	0.009


Table 3: This equipment was connected with temperature probe Model TP202.2, 5/N: 14032382.

Dimensions: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.037	20.1	0.1	0.009
75	23.046	23.1	0.1	0.009
75	30.016	30.0	0.0	0.009
75	35.019	35.0	-0.1	0.009
75	40.002	39.9	-0.1	0.009

USC = 0.1 °C Water Calibration


\*\*\*End of Certificate of Calibration\*\*\*



www.jiranate.com/jiranate.co.,ltd.

 <p><b>J NAC</b> JANAFEE ASSOCIATES CO., LTD.</p> <p>Website: <a href="http://www.jnac.co.th">www.jnac.co.th</a>          Tel: 02-554 1233-5          Fax: 02-554 1233-6          Bangkok: 10110 Thailand          E-mail: <a href="mailto:info@jnac.co.th">info@jnac.co.th</a>          Web site: <a href="http://www.jnac.co.th">www.jnac.co.th</a></p>	<p>Accredited calibration laboratory          ISO/IEC 17025:2005          ISO 9001:2008          CALABRIS 0001-0007</p> <p>Temperature measurement department          Calibration accuracy equivalent</p>	 <p><b>NAC</b> NAC-MRA NAC-TRI - TS1 17025 CALIBRATION 0367</p>		
<h2 style="text-align: center;">CERTIFICATE OF CALIBRATION</h2>				
Certificate No. : <b>CDT-15-68</b>	Page 1 of 2 Pages			
<b>MEASUREMENT ITEM</b> <b>MANUFACTURER</b> <b>MODEL TYPE</b> <b>Serial NUMBER</b> <b>ID NUMBER</b> <b>CONDITION AS RECEIVED</b> <b>CUSTOMER</b>	1. Heat Source Monitor Delta DHM H0372-1 1500074 NAC, F50070 Used Item NAC laboratory group (Hailand) Co., Ltd. 504 Phatthanaburi 45, Phatthanaburi Rd., Khwaeng Suan Luang, Khwa Suan Luang, Bangkok 10250 Thailand.			
<b>RECEIVED DATE</b> <b>MEASUREMENT DATE</b> <b>ISSUE DATE</b>	14 AUG 2015 28 AUG 2015 28 AUG 2015			
<b>ENVIRONMENTAL CONDITIONS:</b> Ambient conditions in the laboratory are as follow: Temperature Relative Humidity	23.0 ± 0.3 °C 55.0 ± 15.0 %RH			
<b>NOTES:</b> The certificate is valid only for the item collected on date and place of collection.				
<b>TABULATION OF RESULTS:</b> The table on next page give the measured values.	<table border="1" style="width: 100%;"> <tr> <td data-bbox="253 1897 354 1991" style="width: 50%; vertical-align: top;"> <b>REVIEW BY:</b>   <b>APPROVED BY:</b>   <b>TEST CAL DATE:</b> 23/07/16         </td> <td data-bbox="354 1897 501 2031" style="width: 50%; vertical-align: top;"> <b>Uncertainty of Measurement:</b>          The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=1. When for a normal distribution corresponds to a coverage probability of approximately 68%. The standard uncertainty has been determined in accordance with the GUM (Evaluation of measurement data - Guide to the expression of uncertainty in measurement)         </td> </tr> </table>		<b>REVIEW BY:</b>  <b>APPROVED BY:</b>  <b>TEST CAL DATE:</b> 23/07/16	<b>Uncertainty of Measurement:</b> The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=1. When for a normal distribution corresponds to a coverage probability of approximately 68%. The standard uncertainty has been determined in accordance with the GUM (Evaluation of measurement data - Guide to the expression of uncertainty in measurement)
<b>REVIEW BY:</b>  <b>APPROVED BY:</b>  <b>TEST CAL DATE:</b> 23/07/16	<b>Uncertainty of Measurement:</b> The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor k=1. When for a normal distribution corresponds to a coverage probability of approximately 68%. The standard uncertainty has been determined in accordance with the GUM (Evaluation of measurement data - Guide to the expression of uncertainty in measurement)			
<b>Calibrated by:</b> Chai Sangthamchai Pichay Limpitthong Mijjagumpang Poommit	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;">  <p>J NAC JANAFEE ASSOCIATES CO., LTD.</p> </div> <div style="text-align: right;">   <b>Approved signature:</b> Mr. Pichay Booncharoen            Calibration Department Manager         </div> </div>			

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED



TRIMARK ASSOCIATES COLLEGE

Continuation of Certificate of Calibration Number CDT-125-08

Page 2 of 2 Pages

**Result of Calibration:** ☒ Without Adjustment ☐ With Adjustment

**Calibration Range:** 20 °C to 40 °C

**Function:**

Table 1: This equipment was connected with wet bulb probe Model: HP3291.2, S/N: 20030302.  
 Dimensions: Diameter 3.1 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.050	20.2	0.2	0.009
80	25.053	25.2	0.1	0.009
80	30.077	30.0	0.1	0.009
80	35.013	35.1	0.1	0.009
80	39.995	40.1	0.1	0.009

Table 2: This equipment was connected with Glue thermometer probe Model: TP3207.2, S/N: 15021838.  
 Dimensions: Diameter 3.2 mm, Length 305 mm.


Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.050	20.1	0.1	0.009
110	25.053	25.4	0.0	0.009
110	30.077	30.1	0.1	0.009
110	35.013	35.1	0.1	0.009
110	39.995	40.1	0.1	0.009

Table 3: This equipment was connected with temperature probe Model: TP3207.2, S/N: 15015488.  
 Dimensions: Diameter 1.6 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	USC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.050	20.2	0.1	0.009
75	25.053	25.1	0.0	0.009
75	30.027	30.0	0.0	0.009
75	35.013	35.0	0.0	0.009
75	39.995	39.9	-0.1	0.009

USC: Wet Bulber Calibration

\*\*\*End of Certificate of Calibration\*\*\*





**J NAC**  
JIBANATSE ASSOCIATES CO., LTD.

Source: AccuCheck Co., Ltd.  
ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, Singapore  
Tel: +65 6339 8888  
E-mail: info@jibanatse.com.sg  
Web site: www.jibanatse.com

*Accredited calibration laboratory*

ACCREDITED BY  
ISO 9001:2015 (J2525)  
CALIBRATION 0367

*Temperature measurement laboratory*  
(Calibration services department)



**UKAS**  
NSC - TIS - TIS 17025  
CALIBRATION 0367

## CERTIFICATE OF CALIBRATION

Certificate No. : **CDP-124-68**

Page 1 of 2 Pages

**MEASUREMENT ITEM**

**MANUFACTURER**

**MODEL TYPE**

**SERIAL NUMBER**

**ID NUMBER**

**CONDITION AS RECEIVED**

**CUSTOMER**

1. Heat Stress Monitor

2. Delta CHM

3. H001-1

4. 1500698

5. BNC-150698

6. Used item

7. SIA Laboratory group (Hafslund) Co., Ltd.

8. SIA (Prestonham) Bld., Prestonham Rd.,

9. Khwaseng Tuan Luang, Khwa Tuan Luang,

10. Bangkok 10350 Thailand

**RECEIVED DATE**

**MEASUREMENT DATE**

**ISSUE DATE**

11. 24 Jul 2025

12. 24 Jul 2025

13. 24 Jul 2025

**ENVIRONMENTAL CONDITIONS:**

Relative humidity in the laboratory are as follows:

Temperature : 23.0 ± 0.8 °C

Relative Humidity : 75.0 ± 15.0 %RH

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

**TABULATION OF RESULTS**

The table are next pages to the item measured values.

**REVIEWED BY** *Shirley F*

**APPROVED BY** *[Signature]*

**NEXT CAL DATE** : 23/01/2026

Calibrated by:

Chia: Szeppah Thachalad

S: Mui, Jibbanatse Leromshai

Q: Mui, Jibbanatse Leromshai



**J NAC**  
JIBANATSE ASSOCIATES CO., LTD.

Approved signature: *[Signature]*

Mr. Manraj Boonchuanon  
Calibration Department Manager

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED



Continuation of Certificate of Calibration Number COT-124-08

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function: Table 1: This equipment was connected with wet bulb probe Model: HP3201.2, S/N: 15015446. Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.059	20.2	0.1	0.099
80	20.048	20.2	0.2	0.099
80	20.050	20.2	0.2	0.099
80	20.051	20.2	0.2	0.099
80	20.052	20.2	0.2	0.099

Table 2: This equipment was connected with Glider thermometer probe Model: TP3207.2, S/N: 15015446. Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.059	20.2	0.1	0.099
110	20.048	20.2	0.2	0.099
110	20.050	20.2	0.2	0.099
110	20.051	20.2	0.2	0.099
110	20.052	20.2	0.2	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2, S/N: 15015446. Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.059	20.2	0.1	0.099
75	20.048	20.2	0.2	0.099
75	20.050	20.2	0.2	0.099
75	20.051	20.2	0.2	0.099
75	20.052	20.2	0.2	0.099

UUC: Unit Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*

Continuation of Certificate of Calibration Number COT-049-08

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function: Table 1: This equipment was connected with wet bulb probe Model: HP3201.2, S/N: 15015446. Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.059	20.2	0.1	0.099
80	20.048	20.2	0.2	0.099
80	20.050	20.2	0.2	0.099
80	20.051	20.2	0.2	0.099
80	20.052	20.2	0.2	0.099

Table 2: This equipment was connected with Glider thermometer probe Model: TP3207.2, S/N: 15015446. Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.059	20.2	0.1	0.099
110	20.048	20.2	0.2	0.099
110	20.050	20.2	0.2	0.099
110	20.051	20.2	0.2	0.099
110	20.052	20.2	0.2	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2, S/N: 15015446. Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.059	20.2	0.1	0.099
75	20.048	20.2	0.2	0.099
75	20.050	20.2	0.2	0.099
75	20.051	20.2	0.2	0.099
75	20.052	20.2	0.2	0.099

UUC: Unit Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*

Continuation of Certificate of Calibration Number COT-049-08

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function: Table 1: This equipment was connected with wet bulb probe Model: HP3201.2, S/N: 15015446. Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.059	20.2	0.1	0.099
80	20.048	20.2	0.2	0.099
80	20.050	20.2	0.2	0.099
80	20.051	20.2	0.2	0.099
80	20.052	20.2	0.2	0.099

Table 2: This equipment was connected with Glider thermometer probe Model: TP3207.2, S/N: 15015446. Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.059	20.2	0.1	0.099
110	20.048	20.2	0.2	0.099
110	20.050	20.2	0.2	0.099
110	20.051	20.2	0.2	0.099
110	20.052	20.2	0.2	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2, S/N: 15015446. Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.059	20.2	0.1	0.099
75	20.048	20.2	0.2	0.099
75	20.050	20.2	0.2	0.099
75	20.051	20.2	0.2	0.099
75	20.052	20.2	0.2	0.099

UUC: Unit Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*

Certificate of Calibration

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function: Table 1: This equipment was connected with wet bulb probe Model: HP3201.2, S/N: 15015446. Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.059	20.2	0.1	0.099
80	20.048	20.2	0.2	0.099
80	20.050	20.2	0.2	0.099
80	20.051	20.2	0.2	0.099
80	20.052	20.2	0.2	0.099

Table 2: This equipment was connected with Glider thermometer probe Model: TP3207.2, S/N: 15015446. Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.059	20.2	0.1	0.099
110	20.048	20.2	0.2	0.099
110	20.050	20.2	0.2	0.099
110	20.051	20.2	0.2	0.099
110	20.052	20.2	0.2	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2, S/N: 15015446. Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.059	20.2	0.1	0.099
75	20.048	20.2	0.2	0.099
75	20.050	20.2	0.2	0.099
75	20.051	20.2	0.2	0.099
75	20.052	20.2	0.2	0.099

UUC: Unit Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*

Continuation of Certificate of Calibration Number COT-050-08

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function: Table 1: This equipment was connected with wet bulb probe Model: HP3201.2, S/N: 15015446. Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.059	20.2	0.1	0.099
80	20.048	20.2	0.2	0.099
80	20.050	20.2	0.2	0.099
80	20.051	20.2	0.2	0.099
80	20.052	20.2	0.2	0.099

Table 2: This equipment was connected with Glider thermometer probe Model: TP3207.2, S/N: 15015446. Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.059	20.2	0.1	0.099
110	20.048	20.2	0.2	0.099
110	20.050	20.2	0.2	0.099
110	20.051	20.2	0.2	0.099
110	20.052	20.2	0.2	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2, S/N: 15015446. Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.059	20.2	0.1	0.099
75	20.048	20.2	0.2	0.099
75	20.050	20.2	0.2	0.099
75	20.051	20.2	0.2	0.099
75	20.052	20.2	0.2	0.099

UUC: Unit Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*

Certificate of Calibration

Result of Calibration: ☒ Without Adjustment ☐ With Adjustment

Calibration Range: 20 °C to 40 °C

Function: Table 1: This equipment was connected with wet bulb probe Model: HP3201.2, S/N: 15015446. Dimension: Diameter 3.3 mm, Length 170 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
80	20.059	20.2	0.1	0.099
80	20.048	20.2	0.2	0.099
80	20.050	20.2	0.2	0.099
80	20.051	20.2	0.2	0.099
80	20.052	20.2	0.2	0.099

Table 2: This equipment was connected with Glider thermometer probe Model: TP3207.2, S/N: 15015446. Dimension: Diameter 3.3 mm, Length 205 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
110	20.059	20.2	0.1	0.099
110	20.048	20.2	0.2	0.099
110	20.050	20.2	0.2	0.099
110	20.051	20.2	0.2	0.099
110	20.052	20.2	0.2	0.099

Table 3: This equipment was connected with temperature probe Model: TP3207.2, S/N: 15015446. Dimension: Diameter 14 mm, Length 150 mm.

Immersion Depth (mm)	Standard Reading (°C)	UUC Reading (°C)	Error (°C)	Uncertainty (°C)
75	20.059	20.2	0.1	0.099
75	20.048	20.2	0.2	0.099
75	20.050	20.2	0.2	0.099
75	20.051	20.2	0.2	0.099
75	20.052	20.2	0.2	0.099

UUC: Unit Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*

Cert. No.: 25PH643

Result of calibration: ( ) Without adjustment ( ) After adjustment

Function: Illuminance Measurement

Standard Value	Before Adjust	After Adjust	Uncertainty
0	0.00	0.00	0.00
15	-	15.06	0.08
100	-	100.8	1.3
500	-	504	6.5
1000	923	1008	8
2000	-	1966	16
3000	-	2970	30
4000	-	3940	52
5000	4530	4910	66

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

Before adjustment light source factor setting mode: L8 = 1.219

After adjustment light source factor setting mode: L8 = 1.321

UUC: Unit Under Calibration

\*\*\*End of Certificate of Calibration\*\*\*

Certificate of Calibration

ISSUED BY: Cirrus Research plc

DATE OF ISSUE: 02 December 2024

CERTIFICATE NUMBER: 228070

Function: doseBadge Reader : IEC 60942:2003

Instrument information: Manufacturer: Cirrus Research plc, Model: RC-116A, Serial number: 89100

Notes: The doseBadge Reader detailed above has been calibrated to the published data as described in the operating manual and in the full-ech configuration. The procedures and techniques used are as described in IEC 60942:2003 Annex B - Periodic Tests and three determinations of the sound pressure level, frequency and total dose were made.

The sound pressure level was measured using a W52F condenser microphone type MK224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

The doseBadge Reader has been shown to conform to the Class 2 requirements for periodic testing, described in Annex B of IEC 60942:2003 for the sound pressure level and frequency (Hz) and total dose (mSv) which the tests were performed.

However, as public evidence was not available, from a testing organisation responsible for pattern approval, to demonstrate that the model of doseBadge Reader conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, no general statement or conclusion can be made about conformance of the doseBadge Reader to the requirements of IEC 60942:2003.

Notes:

\*\*\*End of Certificate of Calibration\*\*\*

Certificate of Calibration

Environmental conditions: The following conditions were recorded at the time of the test: Before Pressure: 100.0 kPa, Temperature: 23.0 °C, Humidity: 39.2 %; After Pressure: 100.0 kPa, Temperature: 23.0 °C, Humidity: 41.5 %

Test equipment: Equipment: Manufacturer: Model: Serial number; DoseBadge Reader: Keithley: 2015: 1053436; Acoustic Calibrator: Bruel and Kjaer: 4231: 2610257; Environmental Monitor: Cornell: 77510: 21962628

Initial Acoustic Results: Level (dB): Expected, Sample 1, Sample 2, Sample 3, Average, Deviation, Tolerance, Uncertainty; Distortion (%): < 4.00, 0.47, 0.47, 0.46, 0.47, 0.47, +4.00, 0.13 %; Frequency (Hz): 1000.0, 1000.1, 1000.2, 1000.1, 1000.1, 0.1, ±200.0, 0.1 Hz

Adjusted Acoustic Results: Level (dB): Expected, Sample 1, Sample 2, Sample 3, Average, Deviation, Tolerance, Uncertainty; Distortion (%): < 4.00, 0.40, 0.40, 0.38, 0.39, 0.39, +4.00, 0.13 %; Frequency (Hz): 1000.0, 1000.2, 1000.1, 1000.1, 1000.1, 0.1, ±200.0, 0.1 Hz

Functionality Results: Function: Result; Keypad: Pass; Battery Power: Pass; Display: Pass; Communication: Pass; 2 way Ir link: Pass; Clock: Pass

End of results



Calibration Report for J NAC. Includes sections for Review, Approved, Next Cal Date, Calibration report number, and detailed measurement data.

Calibration Report for J NAC. Includes sections for Review, Approved, Next Cal Date, Calibration report number, and detailed measurement data.

Calibration Report for J NAC. Includes sections for Review, Approved, Next Cal Date, Calibration report number, and detailed measurement data.

Certificate of Calibration for J NAC. Includes sections for Review, Approved, Next Cal Date, Calibration report number, and detailed measurement data.

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Certificate of Calibration for J NAC. Includes sections for Review, Approved, Next Cal Date, Calibration report number, and detailed measurement data.



Certificate of Calibration for B1: Absolute Acoustical Sensitivity. Includes fields for Frequency, Uncertainty, Range, and a table of results for Initial and Adjusted readings.

Certificate of Calibration for B3: Frequency Weightings. Includes fields for Reference Frequency, Reference Exposure, and a table of results for Frequency, Exposure, and Ratio.

Certificate of Calibration for B6: Latching Overload Indicator. Includes fields for Frequency, Uncertainty, and a table of results for Level, Expected to Overload, and Overloaded.

Calibration Report for the doseBadge Reader. Includes sections for Measurement Item, Environmental Conditions, Calibration Results, and a table of results for DoseBadge Reader Level.

Calibration Report for the doseBadge Reader. Includes sections for Measurement Item, Environmental Conditions, Calibration Results, and a table of results for DoseBadge Reader Level.

Certificate of Calibration for the doseBadge Reader. Includes fields for Issued By, Date of Issue, and a table of results for DoseBadge Reader Level.

Certificate of Calibration for Environmental conditions. Includes fields for Equipment, Manufacturer, Model, and Serial number, and a table of results for Environmental conditions.

Calibration Report for the doseBadge Reader. Includes sections for Measurement Item, Environmental Conditions, Calibration Results, and a table of results for DoseBadge Reader Level.

Calibration Report for the doseBadge Reader. Includes sections for Measurement Item, Environmental Conditions, Calibration Results, and a table of results for DoseBadge Reader Level.



CERTIFICATE OF CALIBRATION

ISSUED BY: Cirrus Research plc

DATE OF ISSUE: 17 September 2025

CERTIFICATE NUMBER: 248491

REVIEW BY: *H. Jones*

APPROVED BY: *[Signature]*

NEXT CAL DATE: 18/09/26

Page 1 of 6

Approved signatory: N Smith

Electronically signed: *[Signature]*



Cirrus Research plc  
Acoustic House  
Bridlington Road  
Hummanby  
North Yorkshire  
YO14 0PH  
United Kingdom

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc

Model: CR 110A1S

Serial number: YE222

Firmware version: 5.4

Notes:

Test summary

Date of calibration: 17 September 2025

The calibration was performed inspecting 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	SDG1XDDQ802965
Attenuator	Cirrus Research	ZE-952	101220
Environmental Monitor	Comet	17516	16868334
dosimetry Reader	Cirrus Research plc	UNIDBA	109292

Notes

This certificate provides traceability of measurement to the SI system of units and is valid for measurement performed at the National Physical Laboratory or other recognised national metrology institute. The 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: 248491

Page 2 of 6

Environmental conditions

The following conditions were recorded at the time of the test

Before Pressure: 100.63 kPa Temperature: 22.3 °C Humidity: 48.1 %

After Pressure: 100.58 kPa Temperature: 22.7 °C Humidity: 48.6 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

CERTIFICATE OF CALIBRATION

Certificate Number: 248491

Page 3 of 6

Laboratory uncertainties

Requirement	Value
Absolute acoustic sensitivity	0.2 dB
Level linearity	0.15 dB
Short duration signals	0.2 dB
Overload latching indication	0.2 dB
Electrical freq. weighting 125 Hz	0.15 dB
Electrical freq. weighting 8 kHz	0.15 dB

CERTIFICATE OF CALIBRATION

Certificate Number: 248491

Page 4 of 6

B1: Absolute Acoustical Sensitivity

Frequency: 1000 Hz

Uncertainty: 0.2 dB

Result: Passed

Name	Input Level (dB)	Reading (dB)	Deviation (dB)	Limits (dB)
Initial	114	114.40	-0.4	113 / 115
Adjusted	114	114.00	0	113 / 115

B2: Linearity Of Response To Steady Signals

Frequency: 1000 Hz

Uncertainty: 0.2 dB

Range: 80 - 130 dB

Result: Passed

Input Level (dB)	Expected Exposure (Pa <sup>2</sup> /s)	Exposure (Pa <sup>2</sup> /s)	Duration (s)	Deviation (Pa <sup>2</sup> /s)	Limits (Pa <sup>2</sup> /s)	Deviation (%)	Limits (%)
80	0.000222	0.000261	20	-0.000039	0.000175 / 0.000280	18	-21 / +26
90	0.003222	0.003149	20	0.000073	0.002546 / 0.004050	-2	-21 / +26
100	0.022222	0.021716	20	0.000506	0.017855 / 0.028009	-2	-21 / +26
110	0.322222	0.307720	20	0.014502	0.254550 / 0.400000	-5	-21 / +26
120	2.222222	2.122208	20	0.100014	1.755555 / 2.800000	-5	-21 / +26
130	22.222223	20.269808	20	1.952415	17.555556 / 28.000001	-9	-21 / +25

CERTIFICATE OF CALIBRATION

Certificate Number: 248491

Page 5 of 6

B3: Frequency Weightings

Reference Frequency: 1000 Hz

Reference Exposure: 5.187557252508

Reference Input Level: 127 dB

Duration: 10 Seconds

Result: Passed

Frequency (Hz)	Exposure (Pa <sup>2</sup> /s)	Exposure Ratio	Ratio Limit	Uncertainty
125	0.133595	0.0257	0.0174 / 0.0347	0.15
8000	3.565495	0.6918	0.246 / 2.465	0.15

B4: Short-Duration Signals

Frequency: 4000 Hz

Uncertainty: 0.2 dB

Result: Passed

Input Level (dB)	Burst Level (dB)	Ratio	Duration (s)	Burst Duration (ms)	Duration Between Bursts (ms)	Expected Exposure (Pa <sup>2</sup> /s)	Exposure (Pa <sup>2</sup> /s)	Deviation (%)	Limits (%)
114	95	1:100	10	10	990	0.003942	0.003853	-2	-21 / +26
129	100	1:1000	10	1	999	0.012487	0.012467	0	-29 / +41

CERTIFICATE OF CALIBRATION

Certificate Number: 248491

Page 6 of 6

B5: Latching Overload Indicator

Frequency: 1000 Hz

Uncertainty: 0.2 dB

Result: Passed

Level (dB)	Expected To Overload	Overloaded
130	No	No
133	Yes	Yes

End of results

J NAC

IRANIAN ASSOCIATES CO., LTD.

Accredited calibration laboratory

ISO/IEC 17025:2017

ACC-05018 (P05)

CALIBRATION 0867

Accredited calibration laboratory

Calibration services department

Iranian Associates Co., Ltd.

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Web: www.jncal.com

REVIEW BY: *H. Jones*

APPROVED BY: *[Signature]*

NEXT CAL DATE: 29/09/26

Calibration report number: CDM-08-68

Page 1 of 2 Pages

MEASUREMENT ITEM

Dosimeter

Manufacturer: Cirrus Research plc

Model: CR 110A1S

Serial number: YE222

IP NUMBER: 584, 75246

CONDITION AS RECEIVED

Customer: JNC Laboratory group (Thailand) Co., Ltd.

184 Puchongwong 46, Puchongwong Rd, Khlong San Luang, Khlong San Luang, Bangkok 10250 Thailand.

RECEIVED DATE

18 Sep 2025

MEASUREMENT DATE

18 Sep 2025

ISSUE DATE

18 Sep 2025

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:

Temperature: 23.0 ± 3.0 °C

Relative Humidity: 55.0 ± 15.0 %

Atmospheric Pressure: 1010.0 ± 10 hPa

PRECONDITIONING

The dosimeter (Unit Under Calibration) was preconditioning 24 hours at ambient conditions prior to calibration being performed.

STANDARD USED DURING CALIBRATION:

Instrument used: dosimetry Reader

Manufacturer: Cirrus Research plc

Model: RC-110A

Serial number: 81035

Remarks: dosimetry Reader (Unit) with Internal Acoustic Calibration to IEC 60424:2003 Class 2

CALIBRATION RESULTS:

Table 3: The results of dose meter calibration are reported in the table below

Dosimeter Reader Level	Net Dosimeter reading	Error	Status
(dB)	(dB)	(dB)	
114.0	114.0	0.0	✓

Calibrated by: J NAC

Approved signatory: Mr. Farooq Banoor

Calibration Department Manager

J NAC

IRANIAN ASSOCIATES CO., LTD.

Accredited calibration laboratory

ISO/IEC 17025:2017

ACC-05018 (P05)

CALIBRATION 0867

Accredited calibration laboratory

Calibration services department

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E-mail: jncal@iranianassociates.com

Web: www.jncal.com

REVIEW BY: *H. Jones*

APPROVED BY: *[Signature]*

NEXT CAL DATE: 18/09/26

Calibration report number: CDM-08-68

Page 1 of 2 Pages

MEASUREMENT ITEM

Dosimeter

Manufacturer: Cirrus Research plc

Model: RC-110A

Serial number: YE222

IP NUMBER: 584, 75246

CONDITION AS RECEIVED

Customer: JNC Laboratory group (Thailand) Co., Ltd.

184 Puchongwong 46, Puchongwong Rd, Khlong San Luang, Khlong San Luang, Bangkok 10250 Thailand.

RECEIVED DATE

18 Sep 2025

MEASUREMENT DATE

18 Sep 2025

ISSUE DATE

18 Sep 2025

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:

Temperature: 23.0 ± 3.0 °C

Relative Humidity: 55.0 ± 15.0 %

Atmospheric Pressure: 1010.0 ± 10 hPa

PRECONDITIONING

The dosimeter (Unit Under Calibration) was preconditioning 24 hours at ambient conditions prior to calibration being performed.

STANDARD USED DURING CALIBRATION:

Instrument used: dosimetry Reader

Manufacturer: Cirrus Research plc

Model: RC-110A

Serial number: 81035

Remarks: dosimetry Reader (Unit) with Internal Acoustic Calibration to IEC 60424:2003 Class 2

CALIBRATION RESULTS:

Table 3: The results of dose meter calibration are reported in the table below

Dosimeter Reader Level	Net Dosimeter reading	Error	Status
(dB)	(dB)	(dB)	
114.0	114.0	0.0	✓

Calibrated by: J NAC

Approved signatory: Mr. Farooq Banoor

Calibration Department Manager

J NAC

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REVIEW BY: *H. Jones*

APPROVED BY: *[Signature]*

NEXT CAL DATE: 18/09/26

Calibration report number: CDM-08-68

Page 1 of 2 Pages

MEASUREMENT ITEM

Dosimeter

Manufacturer: Cirrus Research plc

Model: RC-110A

Serial number: YE222

IP NUMBER: 584, 75246

CONDITION AS RECEIVED

Customer: JNC Laboratory group (Thailand) Co., Ltd.

184 Puchongwong 46, Puchongwong Rd, Khlong San Luang, Khlong San Luang, Bangkok 10250 Thailand.

RECEIVED DATE

18 Sep 2025

MEASUREMENT DATE

18 Sep 2025

ISSUE DATE

18 Sep 2025

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follows:

Temperature: 23.0 ± 3.0 °C

Relative Humidity: 55.0 ± 15.0 %

Atmospheric Pressure: 1010.0 ± 10 hPa

PRECONDITIONING

The dosimeter (Unit Under Calibration) was preconditioning 24 hours at ambient conditions prior to calibration being performed.

STANDARD USED DURING CALIBRATION:

Instrument used: dosimetry Reader

Manufacturer: Cirrus Research plc

Model: RC-110A

Serial number: 81035

Remarks: dosimetry Reader (Unit) with Internal Acoustic Calibration to IEC 60424:2003 Class 2

CALIBRATION RESULTS:

Table 3: The results of dose meter calibration are reported in the table below

Dosimeter Reader Level	Net Dosimeter reading	Error	Status
(dB)	(dB)	(dB)	
114.0	114.0	0.0	✓

Calibrated by: J NAC

Approved signatory: Mr. Farooq Banoor

Calibration Department Manager

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

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CERTIFICATE OF CALIBRATION

ISSUED BY: Cirrus Research plc

DATE OF ISSUE: 01 August 2025

CERTIFICATE NUMBER: 246095

Page 1 of 6

Approved signatory: N Smith

Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc

Model: CR-110AHS

Serial number: YF459

Firmware version: 5.2

Notes:

Date of calibration: 31 July 2025

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	SDG1X00Q802965
Attenuator	Cirrus Research	ZE 967	101220
Environmental Monitor	Comet	T7510	1696234
Dosimetry Reader	Cirrus Research plc	UNIGRA	62910

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 institutions. This certificate may not be reissued later than 6 months after the date of issue without 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: 246095

Page 2 of 6

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 100.78 kPa Temperature: 22.8 °C Humidity: 34.5 %

After Pressure: 100.78 kPa Temperature: 22.8 °C Humidity: 34.9 %

Test results summary

Test	Result
Absolute Acoustic Sensitivity	Complies
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies

CERTIFICATE OF CALIBRATION

Certificate Number: 246095

Page 3 of 6

Laboratory uncertainties

Requirement	Value
Absolute acoustic sensitivity	0.2 dB
Level linearity	0.15 dB
Short duration signals	0.2 dB
Overload latching indication	0.2 dB
Electrical freq. weighting 125 Hz	0.15 dB
Electrical freq. weighting 8 kHz	0.15 dB

CERTIFICATE OF CALIBRATION

Certificate Number: 246095

Page 4 of 6

B1: Absolute Acoustical Sensitivity

Frequency: 1000 Hz

Uncertainty: 0.2 dB

Result: Passed

Name	Input Level (dB)	Reading (dB)	Deviation (dB)	Limits (dB)
Initial	114	115.00	-1	113 / 115
Adjusted	114	114.00	0	113 / 115

B2: Linearity Of Response To Steady Signals

Frequency: 1000 Hz

Uncertainty: 0.2 dB

Range: 80 - 130 dB

Result: Passed

Input Level (dB)	Expected Exposure (Pa <sup>2</sup> /s)	Exposure (Pa <sup>2</sup> /s)	Duration (s)	Deviation (Pa <sup>2</sup> /s)	Limits (Pa <sup>2</sup> /s)	Deviation (%)	Limits (%)
80	0.000222	0.000280	20	-0.000058	0.000175 / 0.000280	-26	-21 / +26
90	0.002222	0.002172	20	0.000050	0.001755 / 0.002800	-2	-21 / +26
100	0.022222	0.021222	20	0.001000	0.017555 / 0.028000	-6	-21 / +26
110	0.222222	0.207390	20	0.014832	0.175555 / 0.280000	-7	-21 / +26
120	2.222222	2.073890	20	0.148324	1.755555 / 2.800000	-7	-21 / +26
130	22.222222	21.222058	20	1.000165	17.555555 / 28.000000	-5	-21 / +26

CERTIFICATE OF CALIBRATION

Certificate Number: 246095

Page 5 of 6

B3: Frequency Weightings

Reference Frequency: 1000 Hz

Reference Exposure: 5.197572512558

Reference Input Level: 127 dB

Duration: 10 Seconds

Result: Passed

Frequency (Hz)	Exposure (Pa <sup>2</sup> /s)	Exposure Ratio	Ratio Limits	Uncertainty
125	0.121831	0.0234	0.0174 / 0.0347	6.15
8000	2.215568	0.4266	0.246 / 2.465	6.15

B4: Short-Duration Signals

Frequency: 4000 Hz

Uncertainty: 0.2 dB

Result: Passed

Input Level (dB)	Input Level (dB)	Ratio	Duration (s)	Burst Duration (ms)	Duration Between Bursts (ms)	Expected Exposure (Pa <sup>2</sup> /s)	Exposure (Pa <sup>2</sup> /s)	Deviation (%)	Limits (%)
114	85	1:100	10	10	990	0.003565	0.003514	-2	-21 / +26
129	100	1:1000	10	1	999	0.011310	0.011635	2	-29 / +41

CERTIFICATE OF CALIBRATION

Certificate Number: 246095

Page 6 of 6

B6: Latching Overload Indicator

Frequency: 1000 Hz

Uncertainty: 0.2 dB

Result: Passed

Level (dB)	Expected To Overload	Overloaded
130	No	No
133	Yes	Yes

CALIBRATION REPORT

Page 1 of 3 Pages

MEASUREMENT ITEM: Dosimeter

MANUFACTURER: Cirrus Research plc

MODEL: CR-110AHS

SERIAL NUMBER: YF459

CONDITION AS-RECEIVED: OK

CONDITION AS-DELIVERED: OK

RECEIVED DATE: 18 Sep 2025

MEASUREMENT DATE: 18 Sep 2025

ISSUE DATE: 18 Sep 2025

ENVIRONMENTAL CONDITIONS:

Location: 104 Phatthanasakan 40 Phatthanasakan Rd, Khet Sam Luang, Bangkok 10260 Thailand.

Temperature: 23.0 ± 0.5 °C

Relative Humidity: 55.0 ± 1.0 %

Atmospheric Pressure: 1015.0 ± 0.5 hPa

PRECONDITIONING:

The dose meter (AHS) under calibration was preconditioned 24 hours at ambient conditions prior to calibration being performed.

STANDARD USED OVERVIEW CALIBRATION:

Instrument name: Dosimetry Reader

Manufacturer: Cirrus Research plc

Model: CR-110AHS

Serial number: YF459

Calibration results:

Table 1: The results of dose meter calibration are reported in the table below.

Dosimeter Reading Level (dB)	Reference Dosimeter Reading (dB)	Error (dB)	Status
114	115.00	-1.00	OK
130	130.00	0.00	OK

Agilent Technologies

Agilent Technologies (Thailand) Limited

104 Phatthanasakan 40 Phatthanasakan Rd, Khet Sam Luang, Bangkok 10260 Thailand

Service Request:

Customer Purchase Order Number: 70371813

Service Request Date: 09/10/2025

Service Order: 007007358

Service Confirmation: 690615581

Delivery Site:

Agilent Technologies (Thailand) Limited Head Office

104 Phatthanasakan 40 Phatthanasakan Rd, Khet Sam Luang, Bangkok 10260 Thailand

Location:

Room: Bldg: Lab: Dept:

Agilent Technologies (Thailand) Limited Head Office

104 Phatthanasakan 40 Phatthanasakan Rd, Khet Sam Luang, Bangkok 10260 Thailand

Agilent Technologies (Thailand) Limited Head Office

104 Phatthanasakan 40 Phatthanasakan Rd, Khet Sam Luang, Bangkok 10260 Thailand

Service Confirmation Number: 000015581

Service Confirmation Date: 03.10.2025

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-IM-7000	ICP-MS 7000 System			
G8416A	SPS 4 Autosampler	AU15430722	ICP-MS 7000	SYS-IM-7000
G8411A	ICIS 3 for Agilent	JP15019227	ICP-MS 7000	SYS-IM-7000
G2202A	PSC 019ET Chiller	ZU15A1948	ICP-MS 7000	SYS-IM-7000
G8403A	Agilent 7000 ICP-MS	JP15471189	ICP-MS 7000	SYS-IM-7000

Service Items:

Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	EQO	Enterprise Operational Qualification	1.00	Agreement Entitlement - 100 % covered	03.10.2025	03.10.2025
1010	S185-S850	ICP-MS Checkout Solutions	1.00	Agreement Entitlement - 100 % covered		

Additional Information:

Learn more about Agilent's Special Offers, Products, Services and our full range of laboratory productivity solutions optimized for your applications and workflows. Visit us at [www.agilent.com/chem](http://www.agilent.com/chem)



#### Service Information:

Problem Description:  
YU-ECO-16-7500-501/412366

Service Provided:  
Perform O2 hardware control, Test logon, tune, BG and stability.  
Test O2 control of instrument (CPM5-BK, EL043)  
After done the instrument test all pass.

Service Overview Code:  
Reason Code: Scheduled Service  
Diagnosis Code: Scheduled Service  
Resolution Code: Scheduled Service

Reported Hours: 5.0	Travel Hours: 1.5	
Customer Field Service Representative Name: Panting Krasathana	Customer Field Service Representative Signature: 	Date: 03 Oct 2025
Customer Name: Anchole Khong	Customer Signature: 	Date: 03 Oct 2025

Additional Comments:

Page 3 of 3



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Certificate No. T250355

Page 1 of 6

### Certificate of Calibration

Equipment : HEATING BLOCK  
Manufacturer : Environmental Express  
Model : SC 196  
Serial No. : 6974CECW3285  
Customer Code : BKK\_EL0054  
ID No. : T530MA3  
Customer : ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanaikan 40, Phatthanaikan Rd.,  
Khwang Phatthanaikan, Khet Suan Luang, Bangkok 10250.  
Customer Location : Acid Digestion Lab  
Date of Receipt : 28 February 2025  
Calibrated By : Atiphong Rongrat (Technician)  
Approved By : / Boonchai Surayawong (Site Calibration Manager)  
Date of Issue : 27 MAR 2025

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

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

FM-L13 00030-05-57



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Certificate No. T250355

Page 2 of 6

### Calibration Report

Equipment : HEATING BLOCK  
Date of Calibration : 4 March 2025  
Environment : Temperature : 24.4-24.9 °C  
Line Voltage : 221.6-226.3 V  
Relative Humidity : 55 - 65 %RH

#### Condition of this results of calibration :

- This equipment was calibrated by insert nine standard thermocouples type T into its chamber, the other one standard thermocouple type T use for ambient temperature measurement. The calibration was done in accordance to WI-T20.
- All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS - 90.
- Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN221-TN230	T240712	19 April 2025
TC	TYPE T	TN231-TN240	T240712	19 April 2025
TC	TYPE T	TN241-TN250	T240401	16 March 2025
TC	TYPE T	TN251-TN260	T240401	16 March 2025
DATA LOGGER	34970A	T191	T240401	16 March 2025
- Condition of calibrated item : good  
Equipment Description :

Time Constant	2	Hour	40	Minute	At	95	°C
Open	<input type="checkbox"/>	Min	<input type="checkbox"/>	Medium	<input type="checkbox"/>	Max	
Close	<input type="checkbox"/>						
Not Available	<input checked="" type="checkbox"/>						
- Adjustment :  
( ) without adjustment ( X ) after adjustment

Approved By:

FM-L13 00030-05-57



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Certificate No. T250355

Page 4 of 6

### Calibration Report

Measurement Results		Average Standard Reading at each position (°C)					
Calibration Point		TN221	TN222	TN223	TN224	TN225	TN226
R1 Hole1-Hole5		94.65	95.17	95.01	95.25	95.12	94.75
CAL POINT	Max	94.65	95.17	95.01	95.25	95.12	94.75
	Min	94.65	95.17	95.01	95.25	95.12	94.75
Average		94.65	95.17	95.01	95.25	95.12	94.75
R2 Hole7-Hole12		TN227	TN228	TN229	TN230	TN231	TN232
Max		94.71	94.36	94.76	95.32	95.44	95.06
Min		94.69	94.33	94.70	95.30	95.40	94.98
Average		94.70	94.34	94.73	95.31	95.42	95.02
R3 Hole13-Hole18		TN233	TN234	TN235	TN236	TN237	TN238
Max		95.26	95.43	95.40	95.71	95.41	95.06
Min		94.24	94.64	95.12	95.18	94.86	94.42
Average		94.80	95.03	95.26	95.45	95.13	94.74
R4 Hole19-Hole24		TN239	TN240	TN241	TN242	TN243	TN244
Max		95.13	95.06	95.04	95.16	95.35	95.09
Min		94.39	94.43	94.80	95.51	94.88	95.12
Average		94.76	94.75	94.92	95.34	95.12	95.10
R5 Hole25-Hole30		TN245	TN246	TN247	TN248	TN249	TN250
Max		94.95	95.81	95.39	95.82	95.66	95.69
Min		94.47	95.03	94.67	94.99	94.84	94.87
Average		94.71	95.42	95.03	95.41	95.25	95.27
R6 Hole31-Hole36		TN251	TN252	TN253	TN254	TN255	TN256
Max		94.97	95.34	94.78	95.39	94.95	95.12
Min		95.29	94.55	95.21	94.62	94.13	94.55
Average		95.67	94.95	95.00	95.00	94.54	94.73
R7 Hole37-Hole42		TN257	TN258	TN259	TN260	TN261	TN262
Max		95.15	95.43	94.61	95.09	95.34	95.31
Min		94.38	94.99	95.31	94.78	94.54	94.72
Average		94.76	95.25	95.71	94.98	94.94	95.11
R8 Hole43-Hole48		TN243	TN244	TN245	TN246	TN247	TN248
Max		95.34	95.87	95.46	95.72	95.05	95.75
Min		95.06	95.10	94.88	94.53	94.87	94.98
Average		95.45	95.48	95.10	95.14	94.96	95.36

Approved By:

FM-L13 00030-05-57



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Certificate No. T250355

Page 5 of 6

### Calibration Report

Measurement Results		Average Standard Reading at each position (°C)					
Calibration Point		TN221	TN222	TN223	TN224	TN225	TN226
R1 Hole1-Hole5		94.65	95.17	95.01	95.25	95.12	94.75
CAL POINT	Max	94.65	95.17	95.01	95.25	95.12	94.75
	Min	94.65	95.17	95.01	95.25	95.12	94.75
Average		94.65	95.17	95.01	95.25	95.12	94.75
R2 Hole7-Hole12		TN227	TN228	TN229	TN230	TN231	TN232
Max		94.71	94.36	94.76	95.32	95.44	95.06
Min		94.69	94.33	94.70	95.30	95.40	94.98
Average		94.70	94.34	94.73	95.31	95.42	95.02
R3 Hole13-Hole18		TN233	TN234	TN235	TN236	TN237	TN238
Max		95.26	95.43	95.40	95.71	95.41	95.06
Min		94.24	94.64	95.12	95.18	94.86	94.42
Average		94.80	95.03	95.26	95.45	95.13	94.74
R4 Hole19-Hole24		TN239	TN240	TN241	TN242	TN243	TN244
Max		95.13	95.06	95.04	95.16	95.35	95.09
Min		94.39	94.43	94.80	95.51	94.88	95.12
Average		94.76	94.75	94.92	95.34	95.12	95.10
R5 Hole25-Hole30		TN245	TN246	TN247	TN248	TN249	TN250
Max		94.95	95.81	95.39	95.82	95.66	95.69
Min		94.47	95.03	94.67	94.99	94.84	94.87
Average		94.71	95.42	95.03	95.41	95.25	95.27
R6 Hole31-Hole36		TN251	TN252	TN253	TN254	TN255	TN256
Max		94.97	95.34	94.78	95.39	94.95	95.12
Min		95.29	94.55	95.21	94.62	94.13	94.55
Average		95.67	94.95	95.00	95.00	94.54	94.73
R7 Hole37-Hole42		TN257	TN258	TN259	TN260	TN261	TN262
Max		95.15	95.43	94.61	95.09	95.34	95.31
Min		94.38	94.99	95.31	94.78	94.54	94.72
Average		94.76	95.25	95.71	94.98	94.94	95.11
R8 Hole43-Hole48		TN243	TN244	TN245	TN246	TN247	TN248
Max		95.34	95.87	95.46	95.72	95.05	95.75
Min		95.06	95.10	94.88	94.53	94.87	94.98
Average		95.45	95.48	95.10	95.14	94.96	95.36

Approved By:

FM-L13 00030-05-57

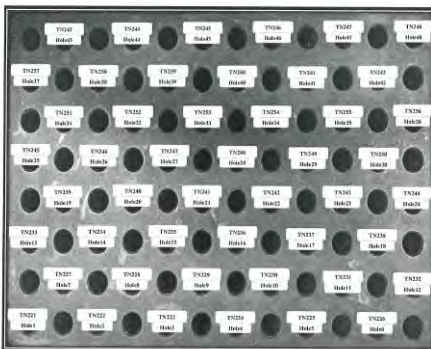


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Certificate No. T250355

Page 3 of 6

### Calibration Report



FRONT CONTROL

Approved By:

FM-L13 00030-05-57



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Certificate No. T250873

Page 6 of 6

### Calibration Report

Measurement Results		Temperature Distribution	
Setting (°C)	Reading (°C)		Stability (°C)
	Min	Average	
32.8	-	102.0	0.43
107.9	-	107.0	0.20

\* The quoted uncertainty exclude " stability "

The calibration result apply only the above calibrated item.

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

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k, which for a t-distribution, providing a level of confidence of approximately 95 %.

Approved By:

FM-L13 00030-05-57



**Metrology Center**  
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51 Moo 8, Talukwong, Kaeng Khoi, Saraburi, Thailand 18200  
Bangkok Tel : +669 0245 6851 / +669 0124 0059  
Saraburi Tel : +669 0247 2390  
Website : www.scieco.co.th E-Mail : calibrate@scg.co.th

Certificate No. T250873

Page 1 of 4

### Certificate of Calibration

Equipment : Chamber ( Cooling Room )  
Manufacturer : KOLDTECH  
Model : KM 320  
Serial No. : TRN-1012661-05  
Customer Code : BKK\_EN0167  
ID No. : T2463A3  
Customer : ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanaikan 40, Phatthanaikan Rd., Khwang Phatthanaikan,  
Khet Suan Luang, Bangkok 10250  
Customer Location : Laboratory Room  
Date of Receipt : 28 May 2025  
Calibrated By : Atiphong Rongrat (Technician)  
Approved By : / Boonchai Surayawong (Site Calibration Manager)  
Date of Issue : 11 JUN 2025

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

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

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51 Moo 8, Talukwong, Kaeng Khoi, Saraburi, Thailand 18200

Certificate No. T250873

Page 2 of 4

### Calibration Report

Equipment : Chamber ( Cooling Room )  
Date of Calibration : 4 June 2025  
Environment : Temperature : 23.4-24.9 °C  
Line Voltage : 221.4-230.2 V  
Relative Humidity : 55 - 65 %RH

#### Condition of this results of calibration :

- This equipment was calibrated by insert 16 standard thermocouples type T into its chamber, the other one standard thermocouple type T use for ambient temperature measurement. The calibration was done in accordance to WI-T20 (based on ASTM E145-94 (Reapproved 2003) and AS2853-1996).
- All data show below were final values and the initial data from customer request. The temperature scale used was based on ITS - 90.
- Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
TC	TYPE T	TN101-TN100	T240306	3 December 2025
TC	TYPE T	TN101-TN110	T240306	3 December 2025
DATA LOGGER	34970A	T121	T240306	3 December 2025
- Condition of calibrated item : good  
Equipment Description :

Time Constant	2	Hour	30	Minute	At	95	°C
Open	<input type="checkbox"/>	Min	<input type="checkbox"/>	Medium	<input type="checkbox"/>	Max	
Close	<input type="checkbox"/>						
Not Available	<input checked="" type="checkbox"/>						
- Adjustment :  
( X ) without adjustment ( ) after adjustment

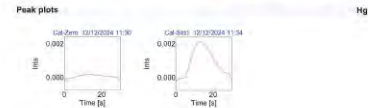
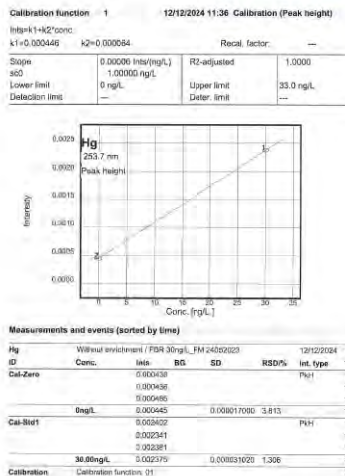
Approved By:

FM-L13 00030-05-57





QC parameters	
QC type	Conc. check
QC check samp. 1	Conc.
Error limit	---
Rep. measurement	off
QC std. 1 (ng/L)	130.000 (ng/L)
QC std. 1 limit	± 50.00%
QC std. act.	flag + continue
Expect. blank abs.	0.0100± 0.0100
QC precision	off
	Reaction
	Reaction: off
	Off: Off
Calibration settings	
Calib. meth.	Standard calib.
No. standards	1
Type of standards	---
Output unit	ng/L
Calib. stat.	Mean
Stock sol. 1	---
Stock sol. 3	---
Type of cal. curve	linear
Weighted cal.	off
Check of cal. curve	no outlier test
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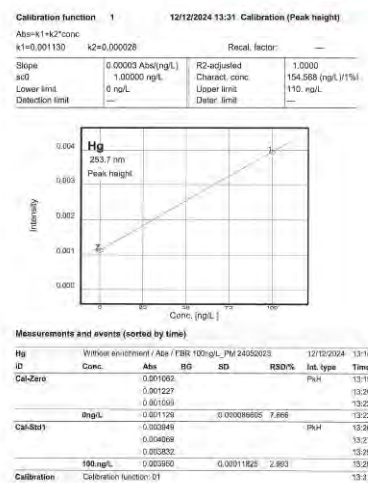
Mercur

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<b>Mercur</b>	
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Program version	4.7.10.0 Printed on 12/12/2024 13:31
Operator	PSU.OTA
Laboratory	ALS-BKK
Code	II_Hg097_2024
Remarks	---
Footwater	---
<b>Method parameters</b>	
Method	Without enrichment / Abs / FBR 100 ng/L PM 2452023
Created on	12/12/2024 Time 12:42
Program	---
<b>Parameters Mercur Technique (Hg absorption)</b>	
Line	253.7 nm
Lamp type	Hg-LP
Integr. mode	Integr. time
PKH	223 V
AZ time	5 s
Delay	8 s
Working mode	no enrich.
FBR technique	on
Pump speed	4
Sample load time	8 s
Reaction time	12 s
Waiting time AZ	18 s
Delay	10 s
Purge time1	50 s
Purge time2	10 s
Autosampler	---
Autosampler Working mode	ASSISF continuous
Tray type	87/139
Dilution	---

QC parameters							
QC type	Conc. check						
QC check samp. 1	Conc.						
Error limit	—						
Rep. measurement	off						
QC std. 1 (ng/L)	11100.00 (ng/L)						
QC std. 1 limit	± 50.00%						
QC std. act.	flag + continue						
Expect. blank abs.	0.0100± 0.0100						
QC precision	off						
Calibration settings							
Calib. meth.	Standard calib.						
No. standards	1						
Type of standards	—						
Output unit	ng/L						
Calib. stat.	Mean						
Stock sol. 1	—						
Stock sol. 3	—						
Type of cal. curve	linear						
Weighted cal.	off						
Check of cal. curve	no outlier test						
Sample statistics							
Stat. mode	Mean						
Confd. level	95.4 %						
Grubbs stat.	—						
Calibration standards							
No.	Name	State	Pos.	Conc./ng/L	trls	SD	RSD(%)
1	Cal-Zero	(-)	79	0.00	H 6.001129 A 0.039164	0.000606 0.004386	7.666 11.23
2	Cal-Sol1	(-)	81	100.00	H 6.003958 A 0.070565	0.000118 0.004795	2.993 6.981



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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATHANAKARNI ROAD SOI 18, SUAN LUANG, SUAN LUANG BANGKOK 10250  
TEL. 0-2711-8009-29 (9X) 0-2718-9484

**Certificate of Calibration**

Cert.No.: 25CH208  
Page: 1 of 3

Equipment: pH Meter  
Manufacturer: Mettler Toledo  
Model: Seven2Go  
Serial No.: B553912470  
ID No.: BKK-LG0031  
Condition As-Received:  
Received Date: 14 February 2025  
Calibration Date: 17 February 2025  
Reference: 2502-0478DSC-1  
Submitted by: ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khuang Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand

Reviewed by: *Chaitan P.*  
Approved by: *Phanisa P.*  
NEXT CAL. DATE: 17/02/26

Use Item

Ambient Temperature: (25 ± 2.5) °C  
(50 ± 15) %  
Relative Humidity:  
Calibration Procedure:  
In-house method:  
- CP-CH6 by direct measurement with DC voltage  
standard and direct measurement with  
certified reference material (CRM)  
- CP-CH6 by comparison with temperature standard

Calibrated by: Waleak Setthwan  
Approved by: *Setthwan*  
Approved Signatory

( ) Chant waeewang  
( ) Porpan Pajin  
(✓) Setthwan Meangmai  
Issue Date: 18 February 2025

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

Cert.No.: 25CH208  
Page: 2 of 3

**Condition of this calibration result**

1. Reference Standard Instrument  
Instrument Serial No. ID No. Cert. No. Due Date  
1) Document Process Calibrator 54030049 130RC116 24E2759 26 Aug 2025  
2) Ref. Standard Thermometer 4862054 110RC244 24I757 14 July 2025  
- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials  
(The measurement results are traceable to SI through Hach Lange GmbH Ltd.,  
Düsseldorf Akkreditierungsbüro, Accredited No. D-IRM-15184-01-00  
(The measurement results are traceable to SI through CPA chem Ltd.,  
ANSI-ABQ National Accreditation Board, Accredited No. AR-1835)

Buffer Solution Manufacturer Lot No. Exp. date  
pH 4.007 CPA chem 1065665 18 Jan 2027  
pH 6.999 Hach Lange GmbH C03220 29 Oct 2026  
pH 10.010 CPA chem 1065669 18 Jan 2026

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

**Calibration Results**  
Function: mV Measurement  
Performing standard curve by Document Process Calibrator at pH (4.7, 10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading	Uncertainty of Measurement	Coverage Factor	
	pH	mV	mV	(mV)	k	
pH Meter	4.00	177.48	177	4.00	0.58	2.00
SN: B553912470	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-178	10.00	0.58	2.00

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Cert.No.: 25CH206  
Page: 3 of 3

#### Calibration Results

##### Function: pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode	4.007	4.01	161	0.0065	2.05
SN: 4261148	6.999	7.00	6	0.0065	2.00
	10.010	10.01	-170	0.0065	2.00

##### Function: Temperature Measurement

(\*) Without adjustment

This equipment was connected with Temperature Probe:

- Model : InLabExpert Go-ISM  
- Serial No. : 4261148  
- Dimension of probe  
Length : 120 mm  
Diameter : 12 mm  
Immersion Depth : 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00
45.0	44.999	45.0	0.001	0.13	2.00

Remark : \* UUC\* = Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD, KUI 18, SUAN LUANG, SUAN LUANG BANGKOK 10250  
TEL: 0-2717-3900 FAX: 0-2717-9484

## Certificate of Testing

Cert.No.: 25TW145  
Page: 1 of 2

Equipment : DO Meter  
Manufacturer : YSI  
Model : 5100  
Serial No. : 16L10254  
ID No. : BKK\_EN0205  
Received Date : 24 July 2025  
Test Date : 25 July 2025  
Reference : 2507-0830DSC-1  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khuang Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand  
Laboratory Condition : Temperature (25 ± 3) °C  
Humidity (60 ± 20) %  
In-house method : CP-CH9  
by Comparison Technique with Acid Modification Method  
Test Procedure :  
Tested by : Wasiak Sirathan  
Approved by :  
( ) Chakrit Wawwanjua  
( ) Porpan Palmit  
(✓) Sathip Meangmai  
Issue Date : 25 July 2025



Cert.No.: 25TW145  
Page: 2 of 2

#### Condition of this result of calibration

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

Instruments	ID No.	Certificate No.	Due Date
1. Burette	1308U10	25C01128	18 Mar 2027
2. Balance	140RC001	24M0601/1	16 Sep 2025

Material	Manufacturer	Lot No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMAS	2203182447	99.6%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %  
Dissolved Oxygen Probe No.: 23L100673

Titration Method (Acid Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.20	0.0055

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD, KUI 18, SUAN LUANG, SUAN LUANG BANGKOK 10250  
TEL: 0-2717-3900 FAX: 0-2717-9484



## Certificate of Calibration

Cert. No.: 25LM122  
Page: 1 of 2

Equipment : DO Meter with Sensor  
Manufacturer : YSI  
Model : 5100  
Serial No. : 15L103204  
ID No. : BKK\_EN0205  
Submitted by : ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khuang Phatthanakan, Khet Suan Luang,  
Bangkok 10250 Thailand  
Location : TPA On Site Calibration Laboratory  
Received Order : 24 July 2025  
Calibrated Date : 25 July 2025  
Ambient Temperature : (26 ± 10) °C  
Relative Humidity : (60 ± 20) %  
AC Line Voltage : (220 ± 22) V  
Calibrated by : Wasiak Lemgagrakul  
Approved by :  
( ) Chakrit Wawwanjua  
( ) Suwit Injai  
(✓) Kunchit Promrat  
Issue Date : 31 July 2025

The uncertainties are for a confidence probability of approximately 95%  
This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.



Equipment : DO Meter with Sensor  
Condition As-Received : Used Item  
Reference : 2507-0830DSC-2  
Procedure Used :  
Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (PIRT) into Temperature Bath.  
The temperature scale used was based on ITS-90.

Cert. No.: 25LM122  
Page: 2 of 2

#### Condition of this result of calibration

1. Reference standard instrument-  
Instrument : Digital Thermometer  
Serial No. : 2188080  
Cert. No. : 241022  
Traceable : TPA  
Due Date : 17 Sep 2025  
2. This certificate is valid only to the item calibrated on date and place of calibration.  
3. This measurement result is traceable to the International System of Unit maintained through :  
Remark : TPA : Technology Promotion Association (Thailand - Japan )  
Result of Calibration : (\*) Without Adjustment  
Function : Temperature measurement.  
This instrument was connected with temperature sensor, SN: 23L100673

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
20.00	80	20.003	19.74	-0.263	0.15	2.00

UUC\* : Unit Under Calibration

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

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Metrology  
SCI ECO Services Company Limited  
33/2 Moo 3, T. Banpa, A. Kaengkhoh, Saraburi 18110, Thailand.  
Saraburi Tel : +66 3627 3096 Fax : +66 3627 3100  
Bangkok Tel : +668 9205 6851, +669 8247 2360  
Website : www.scieco.co.th E-Mail : calibrate@scieco.com



Certificate No. T250356

Page 1 of 4

## Certificate of Calibration

Equipment : Chamber ( Incubator )  
Manufacturer : Memmert  
Model : ICP 750  
Serial No. : F819.0021  
Customer Code : BKK\_EN0304  
ID No. : T9572A4  
Customer : ALS Laboratory Group (Thailand) Co., Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.,  
Khuang Phatthanakan, Khet Suan Luang, Bangkok 10250  
Customer Location : Wei Chemistry Lab 2  
Date of Receipt : 26 February 2025  
Calibrated By : Atiphong Rongrat ( Technician )  
Approved By :  
Date of Issue : 17 MAR 2025

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

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

PM-L15 11818-08-66



Metrology  
SCI ECO Services Company Limited  
33/2 Moo 3, T. Banpa, A. Kaengkhoh, Saraburi 18110, Thailand.



Certificate No. T250356

Page 2 of 4

## Calibration Report

Equipment : Chamber ( Incubator )  
Date of Calibration : 4 March 2025  
Environment : Temperature : 24.5-24.7 °C  
Line Voltage : 221.4-224.7 V  
Relative Humidity : 55-65 %RH

#### Condition of this results of calibration :

1. This equipment was calibrated by insert 12 resistance thermometer detectors into its chamber, the other one resistance thermometer detector use for ambient temperature measurement. The calibration was done in accordance to WI-729 ( based on ASTM E145-94 (Rapproved 2019) and AS2853-1986 ).  
All data shown below were final values and the initial data from customer request. The temperature scale used was based on ITS - 90.

#### 2. Reference Standard Instrument :

Instrument	Model	Instrument No.	Certificate No.	Due Date
RTD	100 ohm	31-CCH1-10	T240399	16 March 2025
RTD	100 ohm	32-CCH1-10	T240399	16 March 2025
DATA LOGGER	34970A	T193	T240399	16 March 2025

#### 3. This certificate is traceable to :

National Institute of Metrology ( Thailand ) through Metrology Center ( NSC-TIS-TIS 17025 CALIBRATION 0244 )

#### 4. Condition of calibrated item : good

Equipment Description :  
Time Constant : 2 Hour  
Fresh Air Damper : ☒ Open ☐ Min ☐ Medium ☐ Max  
☐ Close  
☒ Not Available

5. Adjustment :  
( X ) without adjustment ( ) after adjustment

Approved By :

PM-L15 11818-08-66



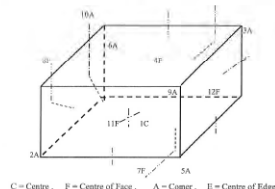
Metrology  
SCI ECO Services Company Limited  
33/2 Moo 3, T. Banpa, A. Kaengkhoh, Saraburi 18110, Thailand.



Certificate No. T250356

Page 3 of 4

## Calibration Report



1C = 31-CH1
2A = 31-CH2
5A = 31-CH5
6A = 31-CH6
7F = 31-CH7
8F = 31-CH8
9A = 31-CH9
10A = 31-CH10
11F = 32-CH1
12F = 32-CH2

Approved By :

PM-L15 11818-08-66



Metrology  
SCI ECO Services Company Limited  
33/2 Moo 3, T. Banpa, A. Kaengkhoh, Saraburi 18110, Thailand.



Certificate No. T250356

Page 4 of 4

## Calibration Report

#### Measurement Results :

Calibration Point	Average Standard Reading at each position (°C)											
	31-CH1	31-CH2	31-CH3	31-CH4	31-CH5	31-CH6	31-CH7	31-CH8	31-CH9	31-CH10	32-CH1	32-CH2
20	20.02	20.42	19.96	20.23	19.83	19.84	19.71	20.01	20.06	20.04	20.13	19.98

Chamber ( Incubator )	Temperature Distribution				
	Reading (°C)	Average (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (°C)
20.0	Min, Max, Average	19.99	0.10	0.43	0.38

The collection result apply only the above calibrated item.

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

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k which for a t-distribution, providing a level of confidence of approximately 95 %.

End of Certificate

Approved By :

PM-L15 11818-08-66













Cert.No.: 25CH1162  
Page: 2 of 3

#### Condition of this calibration result

##### 1. Reference Standard Instrument

Instrument: Ref. Standard Thermometer  
Serial No.: 492054 ID No.: 110RC044 Cert. No.: 25708 Due Date: 03 July 2028  
This measurement result is traceable to SI through Technology Promotion Association (Thailand - Japan).

2. Certified Reference Materials: The measurement results are traceable to SI through CPA chem. Ltd.  
ANIS-ASQ National Accreditation Board, Accredited No. AR-1838

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.007	CPA chem	1114384	12 June 2027
pH 6.965	CPA chem	1006657	18 Jan 2026
pH 10.010	CPA chem	1130355	16 Aug 2026

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

#### Calibration Results

##### Function: pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Uncertainty of pH Measurement (±)	Coverage factor
pH Electrode SN: 252063043080	4.007	3.996	0.0046	2.00
	6.965	6.974	0.0084	2.00
	10.010	9.998	0.0070	2.00

Remark: - Can not connect the BNC because the plug does not match with the socket.



Cert.No.: 25CH1162  
Page: 3 of 3

#### Calibration Results

##### Function: Temperature Measurement

(\*) Without adjustment

This equipment was connected with Temperature Probe:

- Model: PNC281

- Serial No.: 252063043080

Dimension of probe:

- Length: 103 mm.

- Diameter: 12 mm.

- Immersion Depth: 90 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor
25.0	25.001	25.0	-0.001	0.13	2.00

Remark: - UUC\* = Unit Under Calibration

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

-00-



REVIEW BY: *Suphachon P.*  
APPROVED BY: *Manon P.*  
NEXT CAL. DATE: *11/01/26*

#### Test Report

Customer:	ALS Laboratory Group (Thailand) Co., Ltd.
Equipment:	Calibrator
Computer Model:	252063043080
Date of test:	19/02/2025
Environment temperature:	25.5 °C
Humidity:	64.2 %RH

#### Results

Item	Comments	Before	After	Remark
1	Visual Inspect	Pass	Pass	Fail
2	Power Supply	Pass	Pass	Fail
3	Display Check	Pass	Pass	Fail
4	Keyboard Check	Pass	Pass	Fail
5	Function System Program	Pass	Pass	Fail

#### Warning and Error Checked

Item	Event	Before	After
6	Error No.	None	None

#### Check with Standard

Item	Criteria (mg/L)	Before	After	Remark
1	Blank	0.00 mg/L	0.00 mg/L	
2	Standard CD No. 1 (1.024 ± 0.05 mg/L)	0.28 mg/L	0.36 mg/L	
3	Standard CD No. 2 (1.031 ± 0.1 mg/L)	0.34 mg/L	0.31 mg/L	
4	Standard CD No. 3 (1.035 ± 0.14 mg/L)	1.06 mg/L	1.04 mg/L	
5	Standard CD No. 4 (1.040 ± 0.1 mg/L)	0.00 mg/L	0.00 mg/L	
6	Standard CD No. 5 (1.045 ± 0.1 mg/L)	0.00 mg/L	0.00 mg/L	
7	Standard CD No. 6 (1.050 ± 0.1 mg/L)	0.00 mg/L	0.00 mg/L	
8	Standard CD No. 7 (1.055 ± 0.1 mg/L)	0.00 mg/L	0.00 mg/L	
9	Standard CD No. 8 (1.060 ± 0.1 mg/L)	0.00 mg/L	0.00 mg/L	
10	Standard CD No. 9 (1.065 ± 0.1 mg/L)	0.00 mg/L	0.00 mg/L	
11	Standard CD No. 10 (1.070 ± 0.1 mg/L)	0.00 mg/L	0.00 mg/L	
12	Standard CD No. 11 (1.075 ± 0.1 mg/L)	0.00 mg/L	0.00 mg/L	
13	Standard CD No. 12 (1.080 ± 0.1 mg/L)	0.00 mg/L	0.00 mg/L	
14	Standard CD No. 13 (1.085 ± 0.1 mg/L)	0.00 mg/L	0.00 mg/L	

#### Summary of results

Unit: mg/L (decimals) Info: error factor 0.311 (unit) used 72544 measurement uncertainty (uncertainty report 10250)  
Tel: +66 (0) 226-3529 | Fax: +66 (0) 226-3572 | Tlx ID: 010552107930 | Email: th.hach@hach.com | www.th.hach.com



1. This instrument was used on the date and place of calibration. The measurement result is traceable to SI through Technology Promotion Association (Thailand - Japan).

2. This instrument was used on the date and place of calibration. The measurement result is traceable to SI through CPA chem. Ltd. ANIS-ASQ National Accreditation Board, Accredited No. AR-1838

Standard Instrument	Equipment	Lot No.	Exp. date
Standard Instrument (PNC281) (PNC281)	Lot No. 492054	Exp. date: Jan-28	
Standard Instrument (PNC281) (PNC281)	Lot No. 492054	Exp. date: Jan-28	
Unit under calibration	SN: 9102986	Exp. date: 10-Jan-28	
Therm. (temperature)	SN: 4142443	Exp. date: 09-Oct-25	

Test By: *P. P.* Approved by: *S. S.*  
(Mr. Puthipong Duangwattana) (Sutarn Satyangkool)  
Service Engineer Assistant Service Division Manager

Unit: mg/L (decimals) Info: error factor 0.311 (unit) used 72544 measurement uncertainty (uncertainty report 10250)  
Tel: +66 (0) 226-3529 | Fax: +66 (0) 226-3572 | Tlx ID: 010552107930 | Email: th.hach@hach.com | www.th.hach.com

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#### Agilent CrossLab Compliance Services

### Certificate of System Qualification

GC-QQ - GCMS-QQ

System ID: GM-10  
Organization Name: ALS Laboratory Group (Thailand) Co., Ltd.  
Organization Location: 104 Pattayawong Rd., Kwang Suan Luang, Khet Suan Luang, Bangkok 10250

Date: November 21, 2024 2:12:44 PM  
EQP Name: Agilent Recommended, Agilent Recommended

EQP Revision: GC-QQ 35, GCMS-QQ 2.56

Overall Qualification Status: Pass

CDS Logon Verification - GC

Logon: atkkl.amv03

Overall CDS Logon Verification Test Status: Pass

System Inspection and Basic Safety and Operation

Name: 7890

Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status: Pass

Inlet Pressure Accuracy

Name: 7890

Front: MM

Setpoint Status: Pass

Setpoint: 25.0 psi

Actual: 25.2 psi

Accuracy: 0.2 psi

Agilent Recommended: <= 1.2

Date: November 21, 2024 2:12:44 PM

System ID: GM-10

Page 1 / 15

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#### Agilent CrossLab Compliance Services

### Overall Inlet Pressure Accuracy Test Status: Pass

GC Oven Temperature Accuracy

Name: 7890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual: 230.0 228.2 °C

Accuracy: -1.8 °C

Agilent Recommended: <= -1.0 % setpoint in K

<= 1.0 % setpoint in K

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual: 100.0 100.7 °C

Accuracy: 0.7 °C

Agilent Recommended: <= -1.0 % setpoint in K

<= 1.0 % setpoint in K

Overall GC Oven Temperature Accuracy Test Status: Pass

NOTE: This test's 2 comment(s) and 0 deviation(s) are available in the Attachments section

GC Oven Temperature Stability

Name: 7890

Setpoint Status: Pass

Setpoint/Average: 100.0 100.7333 °C

Stability: 0.1 °C

Agilent Recommended: <= 0.5

Date: November 21, 2024 2:12:44 PM

System ID: GM-10

Page 2 / 15

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#### Agilent CrossLab Compliance Services

### Overall GC Oven Temperature Stability Test Status: Pass

NOTE: This test's 1 comment(s) and 0 deviation(s) are available in the Attachments section.

Time El: 70.000

Tested Combination1: Front MM / External TQ

Name: 70.000

Setpoint Status: Pass

Filament: 1

Setpoint Status: Pass

Filament: 2

Overall Time El Test Status: Pass

Scouting Run

Tested Combination1: Front MM / External TQ

Name: 7890A

Source: EI - Extractor

Setpoint Status: Completed

Injection Volume on Column: 1.0 µL

Overall Scouting Run Status: Completed

Instrument Detection Limit

Tested Combination1: Front MM / External TQ

Name: 7890A

Source: EI - Extractor

Setpoint Status: Completed

Injection Volume on Column: 1.0 µL

Overall Scouting Run Status: Completed

Instrument Detection Limit

Tested Combination1: Front MM / External TQ

Name: 7890A

Source: EI - Extractor

Setpoint Status: Completed

Injection Volume on Column: 1.0 µL

Overall Scouting Run Status: Completed

Instrument Detection Limit

Tested Combination1: Front MM / External TQ

Name: 7890A

Source: EI - Extractor

Setpoint Status: Completed

Injection Volume on Column: 1.0 µL

Overall Scouting Run Status: Completed

Instrument Detection Limit

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#### Agilent CrossLab Compliance Services

### Setpoint Status: Pass

Injection Volume on Column: 1.0 µL

Area: 4.50

Agilent Recommended: <= 12.00

Status: Pass

Instrument Detection Limit: 1.54238

Agilent Recommended: <= 4.03800

Status: Pass

Overall Instrument Detection Limit Test Status: Pass

Mass Ratio Precision

Tested Combination1: Front MM / External TQ

Name: 7890A

Source: EI - Extractor

Setpoint Status: Pass

Injection Volume on Column: 0.5 µL

Area Mass 1

Abundance's

RSD: 2.25

Agilent Recommended: <= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Status: Pass

Overall Mass Ratio Precision Test Status: Pass

Mass Ratio

0.10

<= 5.00

Date: November 21, 2024 2:12:44 PM  
System ID: GM-10

Date: November 21, 2024 2:12:44 PM  
System ID: GM-10

Due

Details	
Full Name of Signer:	Supasak Nimsongtham
Logged On User Name:	supasak.nimsongtham@agilent.com
Signature Creation Date:	November 21, 2024
Reason for Signature:	Executed protocol and published this original version of document

**ACE Self Qualification Status**

The installed version of ACE used to deliver this service passed qualification; the results conform with expected values. The self qualification summary report is available in the session folder location SDS\ClearStore\AceSelfQualification.

## Regulatory Disclaimers

This document provides a protocol to verify and record instrument configuration and evidence of proper operation. It has been prepared from our interpretation of applicable regulations as well as industry best practices. The document is designed to provide an important component of a complete compliance package. Validation depends upon many factors and use of this protocol alone does not assure compliance. Agilent Technologies makes no promises or representations as to its sufficiency for any specific regulatory program.

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Date: November 21, 2024 2:12:44 PM  
System ID: GM-10

Date: November 21, 2024 2:12:44 PM  
System ID: G8-10

Date: November 21, 2024 2:12:44 PM  
System ID: GM-10

Date: November 21, 2024 2:12:44 PM  
System ID: GM-10

Date: November 21, 2024 2:12:44 PM  
System ID: GM-10

Date: November 21, 2024 2:12:44 PM  
System ID: CM-10



User Name: nash@nash.dhs.gov						Aircraft Classification: C-17	
Report Generated by Database: DCS/1110986C						Expires On: 08-18	
						Print Date: November 21, 2014 @ 10:24 AM	
<b>GW 10 2334 Transcation log:</b>							
<b>Date</b>	<b>Transaction Date</b>	<b>Activity Performed</b>	<b>Type of Transaction</b>	<b>Optional Information</b>			
November 21, 2014	Audit	Data	Miss Rate Precision - Inspector Data Box Path - C:\MSI\TQ Time: Front MMR, TQ	C:\MSI\MMR\P000			
12:27:18 PM			Sensor ID - E-Sensor - L (P00)	=> 5.00%			
November 21, 2014	Audit	Data	Miss Rate Precision - Inspector Data Box Path - C:\MSI\TQ Time: Front MMR, TQ	C:\MSI\MMR\P000			
10:37:18 PM			Sensor ID - E-Sensor - L (P00)	=> 5.00%			
November 21, 2014	Audit	Data	Miss Rate Precision - Inspector Data Box Path - C:\MSI\TQ Time: Front MMR, TQ	C:\MSI\MMR\P000			
8:10:59 PM			Sensor ID - E-Sensor - L (P00)	=> 5.00%			
November 21, 2014	Audit	Reporting	Reintegration	Reintegration Count = 1- Integration Type: Type=0=Standard Mode= Advanced Anti Slope Geometry - 2-Disk Map Path = C:\MSI\Map Project - 2-Disk Map Report SDDO=Integration Of all Corporation: Of at 4			
November 21, 2014	End	Enrollies	Miss Rate Precision - Inspector Data Box Path - C:\MSI\TQ Time: Front MMR, TQ	Sensor ID - E-Sensor - L (P00) => 5.00%			
November 21, 2014	End	Qualification	Session	OO			
November 21, 2014	Start	Reporting	Session	Name			
November 21, 2014	Audit	Reporting	Session	Report Generated:			
1:17:02 PM				Certificate			
November 21, 2014	Audit	Reporting	Session	Report Generated: Report			
3:37:20 PM							

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---

**Setpoint Status:** Pass

**Overall Log Amp Test Status**

**RFFA**

Tested Combination1	Front	SSL	/ External	SQ
Name:	5977A			

**Setpoint Status:** Pass

Amps	1050	mVz		Drift After Five Minutes:	2	mV		RFFA Voltage:	462	mV
Agilent Recommended:	>=	-100		and	<=	100		<=	1100	

**Overall RFFA Test Status**

**Tune E1**

Tested Combination1	Front	SSL	/ External	SQ
Name:	5977A			

**Setpoint Status:** Pass

Flament:

**Setpoint Status:** Pass

Flament:

**Overall Tune E1 Test Status**

**Signal to Noise E1**

Tested Combination1	Front	SSL	/ External	SQ
Name:	5977A			

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<b>Inlet 1</b>		
Manufacturer	Agilent Technologies	
Name	7890	
Type	SSL	
Location	Front	
Carrier Gas	Helium	
Control Type	Electronic Pressure Control (EPC)	
Purged Inlet	Yes	
<b>Detector 1</b>		
Manufacturer	Agilent Technologies	
Name	Mass Spectrometer	
Type	Mass Spectrometer	
Location	External	
<b>Mass Spectrometer 1</b>		
Manufacturer	Agilent Technologies	
Type	SQ	
Name	5977A	
Serial Number	US1415M209	
Firmware Revision	5977.6.06.21	
High Vacuum System	Turbo Pump	
Scanning Run Standard	OFN Std	
<b>MS EI Source 1</b>		
Manufacturer	Agilent Technologies	
Source Type	EI - Extractor	
Number of Filaments	2	

Date: June 15, 2025 8:40:18 PM

System ID: BNC\_BN00000001

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## Certificate of System Qualification

GC-OQ + GCMS-OQ

Organization ID:	BNS-EN059(GM-7)
Organization Name:	ALS Laboratory Group (Thailand) Co., Ltd.
Organization Location:	104 Pathanakarn 42, Pathanakarn Rd., Khwang Sun Luang, Khut Sun Luang, Bangkok
Date:	June 25, 2025 8:40 PM
EQP Name:	Agilent/Recommended , Agilent/Recommended
EQP Revision:	GC.02.50, GCMS.02.50
Overall Qualification Status:	Pass

REVIEW BY Ngat Sath  
 APPROVED BY Li AL  
 NEXT CAL DATE 25-Dec-26

**System Inspection and Basic Safety and Operation**

Name: 7890

**Setpoint Status:** Pass

**Overall System Inspection and Basic Safety and Operation Test Status**

Pass

**Inlet Pressure Accuracy**

Name: 7890

Front SRL

**Setpoint Status:** Pass

Setpoint	Actual
Inlet Pressure: <u>25.0</u> psi	<u>25.2</u> psi

Accuracy: 10.2 psi

Agilent Recommended: 1.2

**Overall Inlet Pressure Accuracy Test Status**

Pass

**GC Oven Temperature Accuracy**

[illegible]

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Agilent OneScan XL Compliance Statement

Signature

Agilent  
OneScan XL

Signature page was created and published because the ACE sign-off action was executed, which is valid for the entire document including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique user name and personal password. The Agilent representative who has located this service understood the meaning and legal status of an electronic signature. As a trained official operator, the Agilent representative has a unique password and login to access ACE and electronically sign this document. (Other e-signatures can be applied to this document using a Document Content Management or other suitable method offered in your data source and control procedures.)

Details

Full Name of Signer:  
Logged On User Name:  
Signature Creation Date:  
Reason for Signature:

Dapawan Nimsaenghan  
dapawan.nimsaenghan@agilent.com  
June 25, 2025  
  
Executed protocol as published in original version of document.

ACE Self Qualification Status

The installed version of ACE used to deliver this service passed qualification; the results conform with expected values. The self qualification summary report is available in the session folder `SDS\ClearStore\AceSelfQualification`.

Regulatory Declaration

This document provides a protocol to verify and record instrument configurability and evidence of proper operation. It has been prepared from our interpretation of applicable regulations and was not industry best practices. The document is designed to provide an important component of a complete compliance package. Validation depends upon many factors and use of this protocol alone does not assure compliance. Agilent Technologies makes no promises or representations as to its sufficiency for any specific regulatory program.

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Date: June 25, 2025 @ 8:18 PM  
User ID: BMS\_25020503M-7

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Temp		7890	
Setpoint Status:	Pass		
Zone:	Open		
	Setpoint/Actual		
Temperature:	230.0	228.8	°C
Accuracy:	-1.2 °C		
Agilent Recommended:	>= -1.0 °C	% setpoint in K	( -5.0 °C )
	<= 1.0 °C	% setpoint in K	( 5.0 °C )
Setpoint Status:	Pass		
Zone:	Open		
	Setpoint/Actual		
Temperature:	100.0	100.8	°C
Accuracy:	0.8 °C		
Agilent Recommended:	>= -1.0 °C	% setpoint in K	( -3.7 °C )
	<= 1.0 °C	% setpoint in K	( 3.7 °C )
Overall GC Oven Temperature Accuracy Test Status			
Pass			
GC Oven Temperature Stability			
Name:		7890	
Setpoint Status:	Pass		
	Setpoint/Average		
Temperature:	100.0	101.0	°C
Stability:	0.9 °C		
Agilent Recommended:	<= 0.5 °C		
Overall GC Oven Temperature Stability Test Status			
Pass			
Log Amp			
Tested Combination1		Front	SSL / External
Name:		S077A	
Date:	June 26, 2023 8:43:18 PM		
System ID:	60K_IN000000A-7		

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<h2>Instrument Details</h2>		
<b>Purpose</b>		
This section describes the as found system configuration.		
<b>Details</b>		
<b>System</b>		
System ID	BHX_EN0009/GM-7	
Manufacturer	Agilent Technologies	
Name	7890	
<b>Tested Combination 1</b>		
Injection Technique	Manual Injection	
Inlet	Front	
Detector	External	
LTM Included?	No	
<b>Sampler 1</b>		
Manufacturer	Agilent Technologies	
Type	Manual Injection	
Usage	Sample Injection	
Syringe Volume (µL)	10	
<b>Mainframe 1</b>		
Manufacturer	Agilent Technologies	
Name	7890	
Model Number	G3442B	
Serial Number	CN14133181	
Firmware Revision	B.02.03	
Oven Type	Standard	

<div> <div> </div> <div> <p>                     Date: <span>2025-03-25 08:40:18 PM</span>                      System ID: <span>BNC_120505/GM-F</span> </p> </div> </div>		<div> <div> </div> <div> <p>                     Agilent Cross-Device Compliance System                      System ID: BNC_120505/GM-F                      Print Date: Sat, 2025-03-25 08:40:20 PM                 </p> </div> </div>		
<div> <div> </div> <div> <p>GM-F-2025 Transaction log</p> </div> </div>				
Time	Transaction Name	Activity Performed	Type of Transaction	Optional Information
June 13, 2025 10:01:23 AM	Auto	Session Created	Session	Host Name: SCOT1108WGL China Server Number: CSD0775
June 13, 2025 10:01:24 AM	Auto	Configuration	Session	Name
June 13, 2025 10:01:24 AM	Auto	EndSession	Warning	User is Ping/Engineer and does not require an critical role
June 13, 2025 10:04:46 AM	Auto	Engineered	Session	EOP: Apps for primary technique [D] File path: (Physical\scs\Conf\EngConf\scs\MD\US-M-04.mg) EOP File Name: (US-M-04.mg) EOP Name: (AgilentResource\Tools\api\Resour (US-M-04) EOP: Apps for a hybridized technique [D] File path: (Physical\scs\Conf\EngConf\scs\MD\US-M-04.mg) EOP File Name: (US-M-04.mg) EOP Name: (AgilentResource\Tools\api\Resour (US-M-04) EOP Name: (AgilentResource\Tools\api\Resour (US-M-04)
June 13, 2025 10:04:51 AM	Auto	Configuration	Session	Name
June 13, 2025 10:05:03 AM	Auto	Qualification	Session	CO
June 13, 2025 10:05:03 AM	Auto	Execution	System Inspection and Basis: Safety and Operation: 7000 Qualifier Test - No warnings detected	
June 13, 2025 10:05:03 AM	Auto	Execution	System Inspection and Basis: Safety and Operation: 7000 - Qualifier Test - No warnings detected	Run Count: 1
Page 1 / 1				

User Name: [xgustavo.romero@h3m.com](#)

Report Generated By: [H3M](#) | [10/06/2024](#)

System ID: [BQM\\_000000010](#)

Print Date: [June 18, 2025 08:20 PM](#)

GBM-7028 Transaction log

Time	Transaction Date	Activity Path	Type of Transaction	Optional Information
		<a href="#">Authenticated</a>	<a href="#">Session</a>	<a href="#">Host Name: 192.11.190.00</a> <a href="#">Drive/Serial Number:</a> <a href="#">C:\D1\174</a>
<a href="#">June 25, 2025 3:07:07 PM</a>	<a href="#">start</a>	<a href="#">Auth</a>	<a href="#">Session</a>	
<a href="#">June 25, 2025 3:07:50 PM</a>	<a href="#">Auth</a>	<a href="#">SuccessfulSession</a>	<a href="#">Session</a>	<a href="#">None</a>
<a href="#">June 25, 2025 3:08:13 PM</a>	<a href="#">start</a>	<a href="#">Qualification</a>	<a href="#">Session</a>	<a href="#">OQ</a>
<a href="#">June 25, 2025 3:09:36 PM</a>	<a href="#">start</a>	<a href="#">Execution</a>	<a href="#">B07FA - B07FA SQ - Source: E1 -&gt; Extractor</a>	
<a href="#">June 25, 2025 3:10:20 PM</a>	<a href="#">End</a>	<a href="#">Execution</a>	<a href="#">B07FA - B07FA SQ - Source: E1 Run Count: 1 -&gt; Extractor</a>	
<a href="#">June 25, 2025 3:10:30 PM</a>	<a href="#">start</a>	<a href="#">Execution</a>	<a href="#">Begriffe Notizen E1 - Liquid Injection, Form B05, SQ - Source: E1 -&gt; Extractor using Flammen 1 - L = 1200</a>	<a href="#">None</a>
<a href="#">June 25, 2025 3:10:40 PM</a>	<a href="#">start</a>	<a href="#">Execution</a>	<a href="#">B05 - B05T - B07FA SQ - Source: E1 -&gt; Extractor Flammen 1 (Qualitative - No separate annotation)</a>	<a href="#">None</a>
<a href="#">June 25, 2025 4:10:22 PM</a>	<a href="#">start</a>	<a href="#">Execution</a>	<a href="#">Begriffe Notizen E1 - Liquid Injection, Form B05, SQ - Source: E1 -&gt; Extractor using Flammen 1 - L = 1200</a>	<a href="#">None</a>
<a href="#">June 25, 2025 4:10:23 PM</a>	<a href="#">start</a>	<a href="#">Execution</a>	<a href="#">Task E1 - B07FA SQ - Source: E1 -&gt; Extractor Flammen 1 (Qualitative - No separate annotation)</a>	<a href="#">None</a>
<a href="#">June 25, 2025 4:10:43 PM</a>	<a href="#">End</a>	<a href="#">Execution</a>	<a href="#">Task E1 - B07FA SQ - Source: E1 Run Count: 1 E1 -&gt; Extractor Flammen 1 (Qualitative - No separate annotation)</a>	
<a href="#">June 25, 2025 4:10:48 PM</a>	<a href="#">start</a>	<a href="#">Execution</a>	<a href="#">Task E1 - B07FA SQ - Source: E1 -&gt; Extractor Flammen 1 (Qualitative - No separate annotation)</a>	

Page 4 / 3

Agilent Technologies				Agilent CrossLab Compliance	
User Name: agilent@agilent.com Report Generated by: Hsiao-Yen SONG1135@163.COM				Print Date: EN_2008_0308030103 System Date: June 25, 2015 8:40:29 PM	
000-17028 Transaction Log					
Time	Transaction Date	Transaction Date	Authenticity	Type of Transaction	Optional Information
June 25, 2015 8:40:29 PM	End	Execution		Signal-to-Nobel ES - Liquid Injection, Flow: 500, IGC - Source: SI - Evaporator using Fluoront 1 - L1 = 1200	Run Count : 0
June 25, 2015 8:41:00 PM	start	Execution		Signal-to-Nobel ES - Liquid Injection, Flow: 500, IGC - Source: SI - Evaporator using Fluoront 2 - L1 = 1200	None
June 25, 2015 8:41:30 PM	Auto1	Data		Signal-to-Nobel ES - Liquid Injection, Flow: 500, IGC - Source: SI - Evaporator using Fluoront 2 - L1 = 1200	Data File Path: C:\Agilent\msd\msd\2008030103\000-17028_1.D AGW000_2M_1201.D
June 25, 2015 8:42:20 PM	End	Execution		Signal-to-Nobel ES - Liquid Injection, Flow: 500, IGC - Source: SI - Evaporator using Fluoront 1 - L1 = 1200	Run Count : 1
June 25, 2015 8:43:00 PM	Auto2	Data	Not Authenticated	Signal-to-Nobel ES - Liquid Injection, Flow: 500, IGC - Source: SI - Evaporator using Fluoront 2 - L1 = 1200	Deviation Test for Run Count : 1
June 25, 2015 8:48:40 PM	start	Execution		Signal-to-Nobel ES - Liquid Injection, Flow: 500, IGC - Source: SI - Evaporator using Fluoront 1 - L1 = 1200	None
June 25, 2015 8:57:10 PM	Auto3	Data		Signal-to-Nobel ES - Liquid Injection, Flow: 500, IGC - Source: SI - Evaporator using Fluoront 1 - L1 = 1200	Data File Path: C:\Agilent\msd\msd\2008030103\000-17028_3.D AGW000_2M_1201.D
June 25, 2015 8:57:40 PM	Auto4	Data	Out of Range	Out of Range	Deviation test is in a data verification state but the user chose to start anyway

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Agilent GreenLab Composites

# Certificate of System Qualification

00 - GCMS-Q0

Item ID: GMA-3  
 Installation Name: ALS Laboratory Group  
 Installation Location: 154 Phlattemans Road, Swan Island, Bangkok 10250

Date: October 26, 2024 12:05:36 PM  
 Revision: Agilent Recommended - Agilent Recommended  
 GC19.92 GC19.92 03

All Qualification Status: Pass

Ligator Verification - GC  
 7880

All CDS Logon Verification - GC Test Status:

System Inspection and Basic Safety and Operation

Item ID: 7880  
 Installation Name: Pass

System Inspection and Basic Safety and Operation Test Status

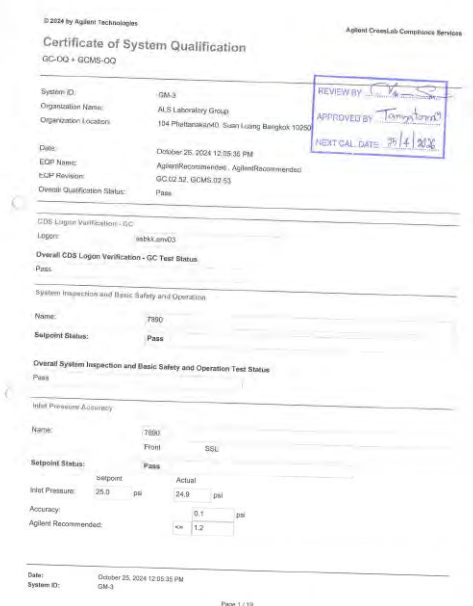
Pressure Accuracy

Item ID: 7880  
 Front: SQL

All Status: Pass

Support: Actual

REVIEW BY: [Signature]  
 APPROVED BY: [Signature]  
 NEXT CAL DATE: 7/1/2025





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<b>Setup/Status:</b>		Pass	
Injection Volume on Column:	1.0 uL		
Area RSD:	0.61 %	Retention Time RSD:	0.01 %
Agilent Recommended:	<= 0.09		<= 1.00
<b>Overall Injection Precision Test Status</b>			
Pass			
<b>Mass Ratio Precision</b>			
<b>Tested Combination:</b>	Front	SSL	/ External SQ
Injection Tower			
Name:	7692A		
Source:	EI - Inlet		
<b>Setup/Status:</b>		Pass	
Injection Volume on Column:	1.0 uL		
Area Mass 1 Abundance's			
RSD:	0.61 %	Mass Ratio	0.33 %
Agilent Recommended:	<= 0.20		<= 1.00
Pass		Pass	
<b>Overall Mass Ratio Precision Test Status</b>			
Pass			

Date: October 25, 2024 12:05:35 PM  
System ID: G06-3

Page 2 / 12

### Purpose

Details	
Full Name of Signer:	Adirek Rattanasujit
Logged On User Name:	adirek.rattanasujit@non.agilent.com
Signature Creation Date:	October 25, 2024
Reason for Signature:	Executed protocol and published the

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<h2>Instrument Details</h2>		
Purpose		
This section describes the as found system configuration.		
Details		
System:		
System ID	QM-3	
Manufacturer	Agilent Technologies	
Name	7890	
Flow Data Input	Manual Data	
Temperature Data Input	Manual Data or Other Data Logging	
Tested Configuration:		
Injection Technique	Injection Tower	
Inlet	Front	
Detector	External	
LTM Induced?	No	
Sampler 1		
Manufacturer	Agilent Technologies	
Type	Injection Tower	
Name	7693A	
Model Number	G4513A	
Serial Number	CN12522102	
Firmware Revision	A.10.07	
Usage	Sample Injection	
Location	Front	
Syringe Volume (µL)	10	
Mainframe 1		
Manufacturer	Agilent Technologies	
Name	7890	
Model Number	G3460A	
Serial Number	CN12521119	
Firmware Revision	A.01.14	
Oven Type	Standard	

Page 9 / 10

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Inlet 1						
Manufacturer	Agilent Technologies					
Name	7890					
Type	SSL					
Location	Front					
Carrier Gas	Helium					
Control Type	Electronic Pressure Control (EPC)					
Purged Inlet	Yes					
Detector 1						
Manufacturer	Agilent Technologies					
Name	Mass Spectrometer					
Type	Mass Spectrometer					
Location	External					
Mass Spectrometer 1						
Manufacturer	Agilent Technologies					
Type	GC					
Name	6890C inertXL with TAD					
Model Number	G3172K					
Serial Number	US19013A11					
Firmware Revision	7.02.29					
High Vacuum System	Turbo Pump					
Scouting Run Standard	MPP S6					
MS II Source 1						
Manufacturer	Agilent Technologies					
Source Type	EI - Inlet					
Number of Elements	2					
<hr/>						
Date:	October 25, 2024 12:00:39 PM					
System ID:	GM-2					
<hr/>						
Page 7 / 19						

Page 10 / 10

User Name: info@arkentus.de

System ID: GMR-9

Report Generated by Hostname: ARKENTUS014

Print Date: October 21, 2024 12:09:37 PM

ALS\_AGGREG\_WB\_01\_33M Transaction Log

Time	Transaction Date	Activity Performed	Type of Transaction	Optional Information
AM				
October 20, 2024 11:01:51	Start	Execution	Signal is Index E1 - ingestion Trans: First BS, 50 - Source: E1 - her-usage Fluxment: 1 - L1 == 200	None
October 20, 2024 11:02:00	End	Done	Signal is Index E1 - ingestion Trans: First BS, 50 - Source: E1 - her-usage Fluxment: 1 - L1 == 200	Data File Path: D:\Data\als\agg\WB\01_33M C:\ProgramData\ARKENTUS\ALS\WB_01_33M
October 20, 2024 11:04:36	AM	Prepping	Fluxment	Preprocessing Count: 1 - Ingestion Type: ingestion; BaseRate:ConstantRate; Advance; Info@Ingestion@1: 10; Info@Ingestion@2: 0; Info@Ingestion@3: 0; Info@Ingestion@4: 1000; Ingestion: Off@0; Ingestion: On@4; Ingestion: Off@4.5;
October 20, 2024 11:04:41	AM	Reporting	Reporting	Preprocessing Count: 2 - Ingestion Type: ingestion; BaseRate:ConstantRate; Advance; Info@Ingestion@1: 10; Info@Ingestion@2: 0; Info@Ingestion@3: 0; Info@Ingestion@4: 1000; Ingestion: Off@0; Ingestion: On@4; Ingestion: Off@4.5;

Page 5 / 11

[illegible]

Agilent Technologies

Agilent CrossLab Compliance 5

User Name: admin@labware.com

Report Generated by Machine: ASD40000214

ALS\_Q002049\_QM-3\_2024 Transaction Log

System ID: QM-3

Print Date: October 20, 2024 10:51:37 PM

Time	Transaction		Type of Transaction	Optional Information
	Date	Activity Performed		
AM				
October 20, 2024 11:45:09	Start	Qualification	Success	OK
October 20, 2024 11:45:09	Start	Reporting	Success	None
October 20, 2024 12:03:37	Auto	Reporting	Success	Report Generated: Certificate
PM				
October 20, 2024 12:04:08	Auto	Reporting	Success	Report Generated: Report PM

Page 11 / 11



### Calibration Instrument Report

Instrument: Automated Discrete Analyzer  
Manufacturer: AMS  
Model: SimerChem 100  
Serial number: 2401055

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
Address: 104 Phatthanakan 40 Alley, Phatthanakan, Suan Luang, Bangkok 10250  
Calibration date: 3 Sep 2023  
Place: ALS Laboratory Group (Thailand) Co., Ltd.

Check fluid to validate the correct functioning of the instrument

INTENDED USE  
Check fluid to validate the correct functioning of the instrument.

Purpose  
The purpose of this document is to aim at the correct execution of the method and the installation of the Check fluid to validate the correct functioning of the instrument.

COMPOSITION  
Plastic Test CHECK-01 20 x 4 x 5 mL (liquid) Lot number: 45751 Expiry date: 2027-04

PROCEDURE  
The reagent is ready to use. Check fluid to validate the correct functioning of the instrument following method CHECK-01 and WORKPLAN CHECK01 DILUTION.

Results For the correct operation of the machine, the expected results are as follows:

1. Evaluation of calibration Results: R<sup>2</sup>

Result	R <sup>2</sup>
Range	+0.995 - 1

Dilution	Replicates	Results (mg/L)	Range	CV% calculated	CV% expected
1/1	x10	0.854	0.899 - 0.810	9.17	≤ 1
1/10	x10	0.811	0.892 - 0.825	1.37	≤ 2
1/20	x10	0.843	0.835 - 0.879	3.49	≤ 2
1/50	x10	0.889	0.810 - 0.750	7.70	≤ 10
1/75	x10	0.798	0.800 - 0.886	11.11	≤ 18

Validation by: *[Signature]*  
Aprim Ekviyarakul

1194 Soi Wetrachasri 47, Sukhumvit 101/1 Rd, Bangkok, Phatthanakan, Bangkok, Thailand 10260  
1194 Wetrachasri 47, Sukhumvit 101/1, Bangkok, Phatthanakan, Bangkok, Thailand 10260



### แบบฟอร์มการประเมินเครื่อง Discrete Analyzer หลังการสอบเทียบ

ชื่อเครื่อง Discrete Analyzer

ID No. BKK\_EN0438

S/N: 2401055

Parameter	Range	Test Results	Pass	Fail	Remark
Evolution of calibration	+0.995 - 1	1.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
CV% calculated Dilution 1/1	≤ 1	0.17	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
CV% calculated Dilution 1/10	≤ 2	1.4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
CV% calculated Dilution 1/20	≤ 5	3.5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
CV% calculated Dilution 1/50	≤ 10	7.70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
CV% calculated Dilution 1/75	≤ 15	11.11	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ผู้ประเมิน: *[Signature]*  
(Aprim Ekviyarakul)  
(05/09/2023)

ผู้รับ: *[Signature]*  
(Sirik Bunrak)  
(05/09/2023)



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
336/4 PHATTHANAKH ROAD 501/15, SUKHUMVI, BANGKOK 10250  
TEL: 0-2717-3000-29 FAX: 0-2713-9484



### Certificate of Calibration

Cert.No.: SAC04714  
Page: 1 of 2

Equipment: Bureta  
Capacity: 10 mL  
Serial No.:  
ID No.: BKK\_EN0298  
Manufacturer: Witeg  
Made in: Germany  
Submitted by: ALS Laboratory Group (Thailand) Co.Ltd.  
104 Phatthanakan 40, Phatthanakan Rd.  
Khweng Phatthanakan, Khwaeng Suan Luang  
Bangkok 10250 Thailand  
Ambient Temperature: (20 ± 2.5) °C  
Relative Humidity: (50 ± 10) %  
Barometric Pressure: 756 mmHg  
Calibration Procedure: ASTM E 942 - 01  
Calibrated by: Sangsarn Wongsa  
Approved by: *[Signature]*  
(✓) Sriada Khanthi  
( ) Porpan Pajim  
( ) Unnopphol Harachai  
Issue Date: 29 November 2024

The Uncertainties are for a confidence probability of approximately 95%

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



Equipment: Bureta  
Received Date: 27 November 2024  
Condition As-Received: Used Item  
Calibration Date: 29 November 2024  
Reference: 2411-0650DSC-1

Cert.No.: 24CG4714  
Page: 2 of 2

### Condition of this result of calibration

- Reference Standard Instruments:  
1) Balance: XPR205, 8134295712, 140RC007, 24MM316, TPA, 15 July 2025  
2) Data Logger: HL-200, 24019652, 140EC016, 24H1826, TPA, 13 Sep 2025  
3) Thermometer: 1594592, 140EC010, 241175, TPA, 20 Feb 2025  
This certification is traceable to SI Unit
- The certificate is valid only to the item calibrated on date and place of calibration.
- True value is converted to true value at the standard temperature of 20 °C

### Calibration result:

Nominal capacity (mL)	Reading (mL)	Uncertainty (± mL)	k Factor
1	1.0047	0.0038	2.00
5	5.0020	0.0036	2.00
10	10.0056	0.0038	2.00

Remark: mL = cm<sup>3</sup>

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

-000-



### Certificate of Calibration

Equipment: pH METER  
Manufacturer: SI Analytics  
Model: TitroLine 7000  
Serial No.: 10013826  
ID No.: BKK\_EN0373  
Condition of the item: Normal

Certificate No.: C07250317  
Job No.: WO-00076560  
Issued Date: 30 June 2025  
Due Date: 30 June 2026  
Page: 1 of 3

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
104 Soi Phatthanakan 40, Phatthanakan Rd.  
Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature: 22.3 °C  
Relative Humidity: 56.3 %  
Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)  
104 Soi Phatthanakan 40, Phatthanakan Rd.  
Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr.Pongpisut Sueboontha

Calibration Date: 30 June 2025

The Method Used: In-house method, CA-WI-56, based on ASTM E 707

Traceability: This certificate is traceable to SI Units. Sample Test is assured through primary measurement method Hamed cell, through CPChem Ltd. (ISO/IEC 17034) Certificate No. 1100242, 1100244, 1034231 And pH Scale traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Industrial Foundation Electrical and Electronics Institute Certificate No. CA20240602EA

*[Signature]*  
(Mr. Pongpisut Sueboontha)  
Person in charge

*[Signature]*  
(Miss Kaewwan Suradech)  
Authorized signatory

This certificate is issued in the units of measurement according to the International System of Units (SI). It provides traceability of measurement to International or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated in the response uncertainty, which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (GUM: 1995).  
This result may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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DKSH Technology Limited  
200 Sukhumvit Road, Bangkok, Phatthanakan, Bangkok 10250  
Phone: +66-2281-7000 Email: info@calibration@dksh.com Website: www.dksh.com/calibration

Delivering Growth - in Asia and Beyond.

CAL-PM-C07-15: 30 Jun 2025



Certificate No.: C07250317 Page 2 of 3

### Calibration Results:

#### pH Scale

Input (mV)	pH Meter Reading (mV)	Error (mV)	pH	Uncertainty of Measurement (mV)	Coverage Factor (k)
414.12	413.9	-0.22	9.000	0.065	2.00
354.96	354.8	-0.16	1.000	0.065	2.00
295.8	295.7	-0.10	2.001	0.065	2.00
236.64	236.5	-0.04	3.001	0.065	2.00
177.48	177.4	-0.08	4.000	0.065	2.00
118.32	118.3	-0.02	5.000	0.065	2.00
59.16	59.1	-0.06	6.000	0.065	2.00
0	0.0	0.00	7.000	0.065	2.00
-59.16	-59.1	0.06	8.000	0.065	2.00
-118.32	-118.3	0.02	9.000	0.065	2.00
-177.48	-177.4	0.08	10.000	0.065	2.00
-236.64	-236.5	0.14	11.000	0.065	2.00
-295.8	-295.6	0.20	12.000	0.065	2.00
-354.96	-354.8	0.16	13.000	0.065	2.00
-414.12	-413.9	0.22	14.000	0.065	2.00

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Phone: +66-2281-7000 Email: info@calibration@dksh.com Website: www.dksh.com/calibration

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CAL-PM-C07-15: 30 Jun 2025



Certificate No.: C07250317 Page 3 of 3

### Sample Test Results

Manufacturer: Thermo Scientific Model: 81575NUM3 Electrode Serial No.: BW11-13563

The three-point calibration using three standard buffer solutions; pH 4.007, pH 6.988 and pH 10.010

- During calibration, display of pH meter can be adjust to reading: pH 4.007, pH 6.988 and pH 10.010

Standard Buffer Solution (pH)	Unit Lender Calibration (pH)	Difference (pH)	Uncertainty of Measurement (pH)	Coverage Factor (k)
4.007	3.999	-0.008	0.0066	2.28
6.988	6.993	0.005	0.0085	2.00
10.010	10.013	0.003	0.013	2.00

### Practical slope and zero point\*

The three-point calibration using three standard buffer solutions; pH 4.007, pH 6.988 and pH 10.010

- During calibration, display of pH meter can be adjust to reading: pH 4.007, pH 6.988 and pH 10.010

The practical slope of the pH electrode: 57.73 (mV/pH), 97.58%

The zero point of the pH electrode: 6.41 (pH)

\* Calibration Marked \* Not TISI Accredited \* in this Certificate have been included for completeness.

The End of Certificate

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Phone: +66-2281-7000 Email: info@calibration@dksh.com Website: www.dksh.com/calibration

CAL-PM-C07-15: 30 Jun 2025

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Phone: +66-2281-7000 Email: info@calibration@dksh.com Website: www.dksh.com/calibration

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CAL-PM-C07-15: 30 Jun 2025



### Checklist for pH Meter

Worksheet number: WO-00076560

Check (receive)	Checklist	Check (send)	Note
30 Jun 2025		30 Jun 2025	
Normal	Detective	Normal	Detective
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 1. Integrity of the tools	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 2. Cleanliness of tools	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 3. On-Off Switch	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 4. Keypad	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 5. Display, Screen Contrast	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 6. Electrode and Connection Cable	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 7. Electrode (Level KCl)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 8. Electrode (Dust Protection Hood)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> 9. Stand	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Recommend:

Mr.Pongpisut Sueboontha  
Service Engineer



### Certificate of Calibration

Equipment: Digital Thermometer with Probe  
Manufacturer: SI Analytics  
Model: TitroLine 7000  
Serial No.: 10013826  
ID No.: BKK\_EN0373  
Condition of the item: Normal

Certificate No.: C15250720  
Job No.: WO-00076560  
Issued Date: 1 July 2025  
Due Date: 30 June 2026  
Page: 1 of 2

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
104 Soi Phatthanakan 40, Phatthanakan Rd.,  
Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature: 30 °C ± 10 °C  
Humidity: 55 %RH ± 25 %RH  
Voltage: 220 VAC ± 10 %

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)  
104 Soi Phatthanakan 40, Phatthanakan Rd.,  
Suan Luang, Bangkok 10250 Thailand

Calibration By: Ms. Kaewwan Suradech  
Calibration Date: 30 June 2025  
The Method used: In-house method, CAL-WI-58, by comparison with standard thermometer  
Traceability: This certificate is traceable to the International System of Unit maintained by: Quality Reborn Co.Ltd. (QR)

*[Signature]*  
(Miss Kaewwan Suradech)  
Person in charge

*[Signature]*  
(Mr. Tewewong Thairanant)  
Authorized signatory

This certificate is issued in the units of measurement according to the International System of Units (SI). It provides traceability of measurement to International or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated in the response uncertainty, which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (GUM: 1995).  
This result may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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CAL-PM-C15-15: 30 Jun 2025



Certificate No.: C15250720  
Page: 2 of 2

Reference standard equipment:

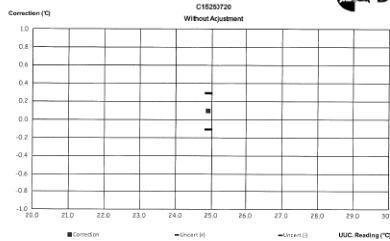
Equipment	Certificate no	Cal. date	Next Cal. date
Digital Thermometer with Probe	QR24-2043	21 August 2024	21 August 2025

Calibration Results:

Without Adjustment

Sensor Type: RTD	Electrode Serial No.: BW1-13563	Channel: -		
Diameter (mm): 12	Length (mm): 120	Immersion (mm): 120		
Calibrate Point.(°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)
25.0	24.994	24.9	0.094	0.20

The End of Certificate



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Certificate of Calibration



Equipment: CONDUCTIVITY METER  
Manufacturer: Thermo Scientific  
Model: ORION STAR A215  
Serial No.: X58031  
ID No.: BKK\_EN0373  
Condition of the item: Normal

Certificate No.: C24250156  
Job No.: WO-00076560  
Issued Date: 30 June 2025  
Due Date: 30 June 2026  
Page: 1 of 2

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
104 Soi Pattanakom 40, Pattanakom Rd.,  
Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature: 22.5 °C ± 0.1 °C  
Relative Humidity: 56.2 % ± 0.4 %

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)  
104 Soi Pattanakom 40, Pattanakom Rd.,  
Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr. Pongsiut Suebchartha  
Calibration Date: 30 June 2025  
The Method Used: In house method, CAL-101-40, based on ASTM D 1125-14 and D 5391-14

Traceability: This certificate is traceable to the SI Units maintained by CRM of NIST(SRM) through  
CPA Chem Co., Ltd. (ISO/IEC 17034) Certificate No. 1566507, 1566508, 1566509

(Mr. Pongsiut Suebchartha)  
Person in charge

(Miss Kaewkan Suradech)  
Authorized signatory

This certificate is issued for the purpose of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data. Guide to the expression of uncertainty in measurement (GUM 1995).  
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CAL-PM-C24-10: 30 Jun 2025



Certificate No.: C24250156  
Page: 2 of 2

Calibration Results:

Manufacturer: Thermo Scientific Model: ORION 013005MD Electrode Serial No.: YV1-18416

Before Adjustment

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty ( ± )
Conductivity Solution	Reading		( k )	
84.003    μS/cm	91.88    μS/cm	-7.877    μS/cm	2.00	0.68    μS/cm
1413.1    μS/cm	1445    μS/cm	-31.9    μS/cm	2.00	11    μS/cm
12.881    mS/cm	13.06    mS/cm	-0.179    mS/cm	2.00	0.098    mS/cm

After Adjustment: at 84.003 µS/cm, 1413.1 µS/cm, 12.880 mS/cm

Standard	Unit Under Calibration	Correction	Coverage Factor	Uncertainty ( ± )
Conductivity Solution	Reading		( k )	
84.003 µS/cm	84.14 µS/cm	-0.137 µS/cm	2.00	0.68 µS/cm
1413.1 µS/cm	1413 µS/cm	0.1 µS/cm	2.00	11 µS/cm
12.881 mS/cm	12.89 mS/cm	-0.009 mS/cm	2.00	0.098 mS/cm

The End of Certificate

Delivering Growth - in Asia and Beyond.

CAL-PM-C24-10: 30 Jun 2025



ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ  
(Digital Thermometer Checklist)

Equipment: Digital Thermometer with Probe

Certificate No.: C15250720

Serial No.: 10013826

Model: TiroLine 7000

Check Date	รายการตรวจเช็ค (Description)	Check before delivery	หมายเหตุ (Remark)
30-Jun-2025		30-Jun-2025	
Normal	Defective	Normal	Defective
General			
<input checked="" type="checkbox"/>	<input type="checkbox"/> 1. สายไฟ (Electric wire)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/> 2. Adaptor / Power supply 220 / 110 VAC	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/> 3. การทำงาน (On/Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/> 4. การทำงาน (Selector Key)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/> 5. หน้าจอแสดงผล (Display)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/> 6. แบตเตอรี่ (Battery)	<input type="checkbox"/>	<input type="checkbox"/> ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/> 7. สภาพตัวเครื่อง (Equipment Body)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/> 8. ตัววัดอุณหภูมิ (Sensor / In / Ex)	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Note:

Ms. Kaewkan Suradech  
Service Engineer

Delivering Growth - in Asia and Beyond.



Certificate of Calibration



Equipment: Digital Thermometer with Probe  
Manufacturer: Thermo Scientific  
Model: ORION STAR A215  
Serial No.: X58031  
ID No.: BKK\_EN0373  
Condition of the item: Normal

Certificate No.: C15250721  
Job No.: WO-00076560  
Issued Date: 1 July 2025  
Due Date: 30 June 2026  
Page: 1 of 2

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
104 Soi Pattanakom 40, Pattanakom Rd.,  
Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature: 30 °C ± 10 °C  
Humidity: 55 %RH ± 25 %RH  
Voltage: 220 VAC ± 10 %

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. (Wet Chemistry Lab 2)  
104 Soi Pattanakom 40, Pattanakom Rd.,  
Suan Luang, Bangkok 10250 Thailand

Calibration By: Ms. Kaewkan Suradech  
Calibration Date: 30 June 2025  
The Method used: In house method, CAL-101-60, by comparison with standard thermometer  
Traceability: This certificate is traceable to the International System of Unit maintained by:  
Quality Return Co., Ltd. (QR)

(Miss Kaewkan Suradech)  
Person in charge

(Mr. Teeweeon Thaimiang)  
Authorized signatory

This certificate is issued for the purpose of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data. Guide to the expression of uncertainty in measurement (GUM 1995).  
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CAL-PM-C15-15: 30 Jun 2025



Certificate No.: C15250721  
Page: 2 of 2

Reference standard equipment:

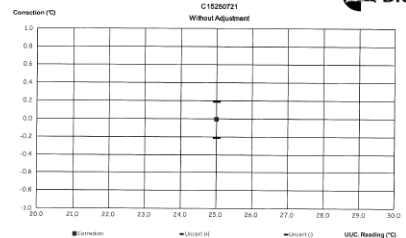
Equipment	Certificate no	Cal. date	Next Cal. date
Digital Thermometer with Probe	QR24-2043	21 August 2024	21 August 2025

Calibration Results:

Without Adjustment

Without Adjustment		Electrode Serial No.: YV1-18416		Channel: -	
Sensor Type: RTD					
Diameter (mm): 15		Length (mm): 120		Immersion (mm): 120	
Calibrate Point (°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)	
25.0	24.994	25.0	-0.006	0.20	

The End of Certificate



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CAL-PM-C15-15: 30 Jun 2025





## ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ (Digital Thermometer Checklist)

Equipment : Digital Thermometer with Probe

Certificate No. : C15250721

Serial No. : X58031

Model : ORION STAR A215

Check Date		รายการตรวจสอบ (Description)	Check before delivery		หมายเหตุ (Remark)
30-Jun-2025			30-Jun-2025		
Normal	Defective		Normal	Defective	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายวัด (Electric wire)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. Adaptor / Power supply 220 / 110 VAC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การกดปุ่ม (On/Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การกดปุ่ม (Selector Key)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอแสดงผล (Display)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. แบตเตอรี่ (Battery)	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพตัวเครื่อง (Equipment Body)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. อินดิเคเตอร์ (Sensor / In / Ex)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Note :

DKSH Technology Limited  
200 Sukhumvit Road, Bangkok, Thailand 10110  
Phone: +66 208 1100 Email: info@dksh.com Website: www.dksh.com/thailand  
Delivering Growth - In Asia and Beyond.

Ms. Kaewkan Suradech  
Service Engineer

## Certificate of Calibration

Equipment: Automatic Titrator  
Manufacturer: SI Analytics  
Model: TitrLine 7000  
Serial No.: 10013826  
ID No.: BKC\_EN0373  
Type of Titration: Motor - driven  
Condition of the Item: Normal

Certificate No.: C32260030  
Job No.: WO-00076560  
Issued Date: 30 June 2025  
Due Date: 30 June 2026  
Page: 1 of 3

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
104 Soi Pattanakarn 40, Pattanakarn Rd.,  
Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature 22 °C ± 0.4 °C  
Relative Humidity 56 % ± 1.4 %  
Atmospheric Pressure 1009 mbar ± 0.4 mbar

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. ( Wet Chemistry Lab 2 )  
104 Soi Pattanakarn 40, Pattanakarn Rd.,  
Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr. Atachai Ngamchanat

Calibration Date: 30 June 2025

The Method Used: In house method, CAL-W157, base on ISO 8655:2002

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited. Certificate No. C01243206

(Mr. Atachai Ngamchanat)  
Person in charge

(Miss Kaewkan Suradech)  
Authorized signatory

This certificate is issued in the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standards or other recognized national standard laboratories.  
The measurement uncertainty stated in the reported uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (GUM:1995).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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CAL-FM-C32-12: 30 Jun 2025



Certificate No.: C32260030 Page: 2 of 2

## Calibration Results:

Nominal Volume 20 ml

Manufacturer: SI Analytics

Exchange Unit Model: WA-20

Burettes Model: TZ 3920

Exchange Unit Serial No.: 10045524

Serial No.: 007734

Nominal Vol.: 20 ml

## Piston burettes of volumetric apparatus for automatic titration

Volume (%)	Volume (ml)	Measurement Volume (V <sub>0</sub> ) (ml)	Systematic error (trueness)		Random error (precision)		Measurement Uncertainty (μl)	k
			es (%)	es (μl)	CV (%)	S. (μl)		
10%	2.0000	1.9997	-0.002	-0.3	0.004	0.7	0.73	2.04
50%	10.0000	10.0076	0.038	7.6	0.003	0.7	1.0	2.00
100%	20.0000	20.0028	0.013	2.6	0.003	0.6	1.5	2.00

## ISO 8655-3:2002(E) Table 1 - Maximum permissible errors for motor-driven piston burettes

Nominal volume	Maximum permissible systematic error		Maximum permissible random error	
	± %	± μl *	± % *	± μl *
ml				
1	0.6	6	0.1	1
2	0.5	10	0.1	2
5	0.3	15	0.1	5
10	0.2	20	0.07	7
20	0.2	40	0.07	14
25	0.2	50	0.07	17.5
50	0.2	100	0.05	25
100	0.2	200	0.03	30

a. Expressed as the deviation of the mean of tenfold measurement from the nominal volume or from the selected volume (see ISO 8655-6:2002, 8.4)

b. Expressed as the coefficient of variation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

c. Expressed as the repeatability standard deviation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

The End of Certificate

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## Checklist for Automatic Titrator

Worksheet number: WO-00076560

Instrument type: Automatic Titrator Model: TitrLine 7000

S/N: 10013826

Check (receive)		Checklist	Check (send)		Note
30 Jun 2025			30 Jun 2025		
Normal	Defective		Normal	Defective	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. Integrity of the tools	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. Cleanliness of tools	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. On-Off Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. Keypad	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. Display, Screen Contrast	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. Piston Burettes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. Function Rinsing and Dosing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. Dosing silicone tube and Accessories	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

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Mr. Atachai Ngamchanat  
Service Engineer

CAL-FM-R55-02: 8 Apr 2025

## Certificate of Calibration

Equipment: Automatic Titrator  
Manufacturer: SI Analytics  
Model: TitrLine 7000  
Serial No.: 10013826  
ID No.: BKC\_EN0373  
Type of Titration: Motor - driven  
Condition of the Item: Normal

Certificate No.: C32260031  
Job No.: WO-00076560  
Issued Date: 30 June 2025  
Due Date: 30 June 2026  
Page: 1 of 3

Customer: ALS Laboratory Group (Thailand) Co., Ltd.  
104 Soi Pattanakarn 40, Pattanakarn Rd.,  
Suan Luang, Bangkok 10250 Thailand

Environment Condition: Temperature 22 °C ± 0.2 °C  
Relative Humidity 56 % ± 1.9 %  
Atmospheric Pressure 1009 mbar ± 0.2 mbar

Calibration Place: ALS Laboratory Group (Thailand) Co., Ltd. ( Wet Chemistry Lab 2 )  
104 Soi Pattanakarn 40, Pattanakarn Rd.,  
Suan Luang, Bangkok 10250 Thailand

Calibration By: Mr. Atachai Ngamchanat

Calibration Date: 30 June 2025

The Method Used: In house method, CAL-W157, base on ISO 8655:2002

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited. Certificate No. C01243206

(Mr. Atachai Ngamchanat)  
Person in charge

(Miss Kaewkan Suradech)  
Authorized signatory

This certificate is issued in the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standards or other recognized national standard laboratories.  
The measurement uncertainty stated in the reported uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with Evaluation of measurement data - Guide to the expression of uncertainty in measurement (GUM:1995).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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CAL-FM-C32-12: 30 Jun 2025



Certificate No.: C32260031 Page: 2 of 2

## Calibration Results:

Nominal Volume 20 ml

Manufacturer: SI Analytics

Exchange Unit Model: WA-20

Burettes Model: TZ 3920

Exchange Unit Serial No.: 10045489

Serial No.: 007773

Nominal Vol.: 20 ml

## Piston burettes of volumetric apparatus for automatic titration

Volume (%)	Volume (ml)	Measurement Volume (V <sub>0</sub> ) (ml)	Systematic error (trueness)		Random error (precision)		Measurement Uncertainty (μl)	k
			es (%)	es (μl)	CV (%)	S. (μl)		
10%	2.0000	2.0009	0.004	0.9	0.004	0.7	0.73	2.04
50%	10.0000	10.0050	0.025	5.0	0.002	0.4	0.90	2.00
100%	20.0000	20.0054	0.027	5.4	0.003	0.5	1.5	2.00

## ISO 8655-3:2002(E) Table 1 - Maximum permissible errors for motor-driven piston burettes

Nominal volume	Maximum permissible systematic error		Maximum permissible random error	
	± %	± μl *	± % *	± μl *
ml				
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2	0.5	10	0.1	2
5	0.3	15	0.1	5
10	0.2	20	0.07	7
20	0.2	40	0.07	14
25	0.2	50	0.07	17.5
50	0.2	100	0.05	25
100	0.2	200	0.03	30

a. Expressed as the deviation of the mean of tenfold measurement from the nominal volume or from the selected volume (see ISO 8655-6:2002, 8.4)

b. Expressed as the coefficient of variation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

c. Expressed as the repeatability standard deviation of a tenfold measurement (see ISO 8655-6:2002, 8.5)

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CAL-FM-C32-12: 30 Jun 2025



## Checklist for Automatic Titrator

Worksheet number: WO-00076560

Instrument type: Automatic Titrator Model: TitrLine 7000

S/N: 10013826

Check (receive)		Checklist	Check (send)		Note
30 Jun 2025			30 Jun 2025		
Normal	Defective		Normal	Defective	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. Integrity of the tools	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. Cleanliness of tools	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. On-Off Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. Keypad	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. Display, Screen Contrast	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. Piston Burettes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. Function Rinsing and Dosing	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. Dosing silicone tube and Accessories	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

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CAL-FM-R55-02: 8 Apr 2025