

ภาคผนวก ซ-1

มาตรฐานตามประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 24 (พ.ศ. 2547)

เรื่อง กำหนดมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป

ประกาศในราชกิจจานุเบกษา เล่ม 121 ตอนพิเศษ 104 ง วันที่ 22 กันยายน พ.ศ. 2547





ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ

ฉบับที่ ๒๔ (พ.ศ. ๒๕๔๗)

เรื่อง กำหนดมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป

อาศัยอำนาจตามความในมาตรา ๓๒ และมาตรา ๓๔ แห่งพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ อันเป็นพระราชบัญญัติที่มีบทบัญญัติบางประการเกี่ยวกับการจำกัดสิทธิและเสรีภาพของบุคคล ซึ่งมาตรา ๒๙ ประกอบกับมาตรา ๓๕ มาตรา ๔๘ มาตรา ๕๐ และมาตรา ๕๑ ของรัฐธรรมนูญแห่งราชอาณาจักรไทยบัญญัติให้กระทำได้โดยอาศัยอำนาจตามบทบัญญัติแห่งกฎหมาย คณะกรรมการสิ่งแวดล้อมแห่งชาติ จึงได้มีมติในคราวการประชุมครั้งที่ ๒/๒๕๔๗ เมื่อวันที่ ๒๔ กุมภาพันธ์ ๒๕๔๗ ให้ปรับปรุงแก้ไขมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป ดังต่อไปนี้

ข้อ ๑ ให้ยกเลิกความใน (๔) ของข้อ ๒ แห่งประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ ๑๐ (พ.ศ. ๒๕๓๘) ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ เรื่อง กำหนดมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป และให้ใช้ความต่อไปนี้แทน

“(๔) ค่าเฉลี่ยของก๊าซซัลเฟอร์ไดออกไซด์ ในเวลา ๒๔ ชั่วโมง จะต้องไม่เกิน ๐.๑๒ ส่วนในล้านส่วน หรือไม่เกิน ๐.๓๐ มิลลิกรัมต่อลูกบาศก์เมตร และค่ามัธยฐานเลขคณิต (Arithmetic Mean) ในเวลา ๑ ปี จะต้องไม่เกิน ๐.๐๔ ส่วนในล้านส่วน หรือไม่เกิน ๐.๑๐ มิลลิกรัมต่อลูกบาศก์เมตร”

ข้อ ๒ ให้ยกเลิกความใน (๒) และ (๓) ของข้อ ๔ แห่งประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ ๑๐ (พ.ศ. ๒๕๓๘) ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ เรื่อง กำหนดมาตรฐานคุณภาพอากาศในบรรยากาศโดยทั่วไป และให้ใช้ความต่อไปนี้แทน

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

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

ประกาศ ณ วันที่ ๙ สิงหาคม พ.ศ. ๒๕๕๗

(ลงนาม) จาตุรนต์ ฉายแสง

(นายจาตุรนต์ ฉายแสง)

รองนายกรัฐมนตรี

ปฏิบัติหน้าที่ประธานคณะกรรมการสิ่งแวดล้อมแห่งชาติ

ราชกิจจานุเบกษา ฉบับประกาศทั่วไป เล่ม ๑๒๑ ตอนพิเศษ ๑๐๔ ง วันที่ ๒๒ กันยายน ๒๕๕๗

ภาคผนวก ซ-2

มาตรฐานตามประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 15 (พ.ศ. 2540)

เรื่อง กำหนดมาตรฐานระดับเสียงโดยทั่วไป

ประกาศในราชกิจจานุเบกษา เล่ม 114 ตอนที่ 279 วันที่ 3 เมษายน พ.ศ. 2540



ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ

ฉบับที่ ๑๕ (พ.ศ. ๒๕๕๐)

เรื่อง กำหนดมาตรฐานระดับเสียงโดยทั่วไป

อาศัยอำนาจตามความในมาตรา ๓๒ (๕) แห่งพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ คณะกรรมการสิ่งแวดล้อมแห่งชาติ กำหนดมาตรฐานเสียงทั่วไปไว้ดังต่อไปนี้

ข้อ ๑ ในประกาศนี้

“ระดับเสียงโดยทั่วไป” หมายความว่า ระดับเสียงที่เกิดขึ้นในสิ่งแวดล้อม

“ค่าระดับเสียงสูงสุด” หมายความว่า ค่าระดับเสียงสูงสุดที่เกิดขึ้นในขณะใดขณะหนึ่งระหว่างการตรวจวัดระดับเสียง โดยมีหน่วยเป็นเดซิเบลเอ หรือ dB (A)

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

“มาตรฐานระดับเสียง” หมายความว่า เครื่องวัดระดับเสียงตามมาตรฐาน IEC ๖๕๑ หรือ IEC ๘๐๔ ของคณะกรรมการการระหว่างประเทศว่าด้วยเทคนิคไฟฟ้า (International Electrotechnical Commission, IEC)

ข้อ ๒ ให้กำหนดมาตรฐานระดับเสียงโดยทั่วไป ไว้ดังต่อไปนี้

(๑) ค่าระดับเสียงสูงสุด ไม่เกิน ๑๑๕ เดซิเบลเอ

(๒) ค่าระดับเสียงเฉลี่ย ๒๔ ชั่วโมง ไม่เกิน ๗๐ เดซิเบลเอ

ข้อ ๓ การตรวจวัดระดับเสียงโดยทั่วไป ให้ดำเนินการดังต่อไปนี้

(๑) การตรวจวัดค่าระดับเสียงสูงสุด ให้ใช้มาตรระดับเสียงตรวจวัดระดับเสียงในบริเวณที่มีคนอยู่หรืออาศัยอยู่

(๒) การตรวจวัดค่าระดับเสียงเฉลี่ย ๒๔ ชั่วโมง ให้ใช้มาตรระดับเสียงตรวจวัดระดับเสียงอย่างต่อเนื่องตลอดเวลา ๒๔ ชั่วโมงใดๆ

(๓) การตั้งไมโครโฟนของมาตรระดับเสียงที่บริเวณภายนอกอาคาร ให้ตั้งสูงจากพื้นไม่น้อยกว่า ๑.๒๐ เมตร โดยในรัศมี ๓.๕๐ เมตร ตามแนวราบรอบไมโครโฟน ต้องไม่มีกำแพงหรือสิ่งใดที่มีคุณสมบัติในการสะท้อนเสียงกีดขวางอยู่

(๔) การตั้งไมโครโฟนของมาตรระดับเสียงที่บริเวณภายในอาคาร ให้ตั้งสูงจากพื้นไม่น้อยกว่า ๑.๒๐ เมตร โดยในรัศมี ๑.๐๐ เมตร ตามแนวราบรอบไมโครโฟน ต้องไม่มีกำแพงสิ่งใดที่มีคุณสมบัติในการสะท้อนเสียงกีดขวางอยู่ และต้องห่างจากช่องหน้าต่างหรือช่องทางที่เปิดออกนอกอาคารอย่างน้อย ๑.๕๐ เมตร

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

ประกาศ ณ วันที่ ๑๒ มีนาคม พ.ศ. ๒๕๕๐

พลเอก ชวลิต ยงใจยุทธ

นายกรัฐมนตรี

ประธานคณะกรรมการสิ่งแวดล้อมแห่งชาติ

ภาคผนวก ซ-3

มาตรฐานตามประกาศกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม
เรื่อง กำหนดมาตรฐานควบคุมระดับเสียงและความสั่นสะเทือนจากการทำเหมืองหิน
ประกาศในราชกิจจานุเบกษา เล่ม 122 ตอนที่ 125 ง วันที่ 29 ธันวาคม พ.ศ. 2548



ประกาศกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม

เรื่อง กำหนดมาตรฐานควบคุมระดับเสียงและความสั่นสะเทือนจากการทำเหมืองหิน

โดยที่ได้มีการปฏิรูประบบราชการ โดยให้มีการจัดตั้งกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อมขึ้นมา และให้โอนภารกิจของกระทรวงวิทยาศาสตร์ เทคโนโลยีและสิ่งแวดล้อม ในส่วนที่เกี่ยวข้องกับพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ ไปเป็นของกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม จึงเห็นสมควรแก้ไขปรับปรุงประกาศกระทรวงวิทยาศาสตร์ เทคโนโลยีและสิ่งแวดล้อม เรื่อง กำหนดมาตรฐานควบคุมระดับเสียงและความสั่นสะเทือนจากการทำเหมืองหิน

อาศัยอำนาจตามความในมาตรา ๕๕ แห่งพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ แก้ไขโดยมาตรา ๑๑๔ แห่งพระราชกฤษฎีกาแก้ไขบทบัญญัติให้สอดคล้องกับการโอนอำนาจหน้าที่ของส่วนราชการ ให้เป็นไปตามพระราชบัญญัติปรับปรุงกระทรวง ทบวง กรม พ.ศ. ๒๕๔๕ พ.ศ. ๒๕๔๕ อันเป็นพระราชบัญญัติที่มีบทบัญญัติบางประการเกี่ยวกับการจำกัดสิทธิและเสรีภาพของบุคคล ซึ่งมาตรา ๒๕ ประกอบกับมาตรา ๓๕ มาตรา ๔๘ มาตรา ๕๐ และมาตรา ๕๑ ของรัฐธรรมนูญแห่งราชอาณาจักรไทยบัญญัติให้กระทำได้ โดยอาศัยอำนาจตามบทบัญญัติแห่งกฎหมาย รัฐมนตรีว่าการกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม โดยคำแนะนำของคณะกรรมการควบคุมมลพิษ และโดยความเห็นชอบของคณะกรรมการสิ่งแวดล้อมแห่งชาติ จึงออกประกาศไว้ ดังต่อไปนี้

ข้อ ๑ ให้ยกเลิกประกาศกระทรวงวิทยาศาสตร์ เทคโนโลยีและสิ่งแวดล้อม เรื่อง กำหนดมาตรฐานควบคุมระดับเสียงและความสั่นสะเทือนจากการทำเหมืองหิน ลงวันที่ ๒๓ พฤศจิกายน พ.ศ. ๒๕๓๕

ข้อ ๒ ในประกาศนี้

“การทำเหมืองหิน” หมายความว่า การประกอบกิจการระเบิดและย่อยหิน ตามกฎหมายว่าด้วยแร่ หรือการประกอบกิจการโรงงานเกี่ยวกับการไม่ บด หรือย่อยหิน ตามกฎหมายว่าด้วยโรงงาน

“ค่าระดับเสียงสูงสุด” หมายความว่า ค่าระดับเสียงสูงสุดที่เกิดขึ้นในขณะใดขณะหนึ่งระหว่างการตรวจวัดระดับเสียง โดยมีหน่วยเป็นเดซิเบลเอ หรือ dB (A)

“ค่าระดับเสียงเฉลี่ย ๘ ชั่วโมง” หมายความว่า ค่าระดับเสียงคงที่ที่มีพลังงานเทียบเท่าระดับเสียงที่เกิดขึ้นจริง มีระดับเสียงเปลี่ยนแปลงตามเวลาในช่วง ๘ ชั่วโมง (๘ hours A-weighted Equivalent Continuous Sound Level) ซึ่งเรียกโดยย่อว่า Leq ๘ hr โดยมีหน่วยเป็นเดซิเบลเอ หรือ dB (A)

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

“มาตรฐานระดับเสียง” หมายความว่า เครื่องวัดระดับเสียงตามมาตรฐาน ฉบับที่ ๖๕๑, ฉบับที่ ๘๐๔ หรือฉบับที่ ๖๑๖๑๒ ของคณะกรรมการการระหว่างประเทศ ว่าด้วยเทคนิคไฟฟ้า ซึ่งเรียกโดยย่อว่า ไอ อี ซี (International Electrotechnical Commission, IEC) หรือเครื่องวัดระดับเสียงอื่นที่เทียบเท่ามาตรฐาน ฉบับที่ ๖๑๖๑๒

“มาตรฐานกันสะเทือน” หมายความว่า เครื่องวัดความสั่นสะเทือนตามมาตรฐานองค์การระหว่างประเทศ ว่าด้วยมาตรฐาน (International Organization for Standardization) ที่ ISO ๔๘๖๖ ข้อ ๓ ให้กำหนดมาตรฐานควบคุมระดับเสียงจากการทำเหมืองหินไว้ ดังต่อไปนี้

- (๑) ค่าระดับเสียงสูงสุด ไม่เกิน ๑๑๕ เดซิเบลเอ
- (๒) ค่าระดับเสียงเฉลี่ย ๘ ชั่วโมง ไม่เกิน ๘๕ เดซิเบลเอ
- (๓) ค่าระดับเสียงเฉลี่ย ๒๔ ชั่วโมง ไม่เกิน ๗๐ เดซิเบลเอ

ข้อ ๔ การตรวจวัดระดับเสียงจากการทำเหมืองหิน ให้ทำตามขั้นตอน ดังต่อไปนี้

(๑) การตรวจวัดค่าระดับเสียงสูงสุด ให้ใช้มาตรฐานระดับเสียงตรวจวัดระดับเสียงเป็นค่า SPL (Sound Pressure Level) ในขณะระเบิดหิน

(๒) การตรวจวัดค่าระดับเฉลี่ย ๘ ชั่วโมง ให้ใช้มาตรฐานระดับเสียงตรวจวัดระดับเสียงอย่างต่อเนื่องตลอดเวลา ๘ ชั่วโมง ที่มีการไม่ บด และย่อยหิน

(๓) การตรวจวัดค่าระดับเสียงเฉลี่ย ๒๔ ชั่วโมง ให้ใช้มาตรฐานระดับเสียงตรวจวัดระดับเสียงอย่างต่อเนื่องตลอดเวลา ๒๔ ชั่วโมงใด ๆ

(๔) การตั้งไมโครโฟนของมาตรฐานระดับเสียงให้ตั้งในบริเวณขอบของเขตประธานบัตรหรือเขตประกอบการ หรือขอบด้านนอกของเขตกันชน (Buffer Zone) และในเขตที่มีการร้องเรียน ตามวิธีการที่องค์การระหว่างประเทศ ว่าด้วยมาตรฐาน (International Organization for Standardization) กำหนดไว้ตาม ISO Recommendation R ๑๕๕๖ ซึ่งมีรายละเอียดตามที่กำหนดไว้ในภาคผนวก ๑ ท้ายประกาศนี้

ข้อ ๕ การคำนวณค่าระดับเสียงจะต้องเป็นไปตามวิธีการที่องค์การระหว่างประเทศ ว่าด้วยมาตรฐาน (International Organization for Standardization) กำหนด ซึ่งมีรายละเอียดตามที่กำหนดไว้ในภาคผนวก ๒ ท้ายประกาศนี้

ข้อ ๖ ให้กำหนดมาตรฐานความสั่นสะเทือนจากการทำเหมืองหินไว้ ดังต่อไปนี้

(๑) ความถี่ ๑ เฮิรตซ์ ความเร็วของอนุภาคไม่เกิน ๔.๗ มิลลิเมตรต่อวินาที และการจัดไม่เกิน ๐.๑๕ มิลลิเมตร

(๒) ความถี่ ๒ เฮิรตซ์ ความเร็วของอนุภาคไม่เกิน ๕.๔ มิลลิเมตรต่อวินาที และการจัดไม่เกิน ๐.๑๕ มิลลิเมตร

(๓) ความถี่ ๓ เฮิรตซ์ ความเร็วของอนุภาคไม่เกิน ๑๒.๗ มิลลิเมตรต่อวินาที และการจัดไม่เกิน ๐.๖๗ มิลลิเมตร

(๔) ความถี่ ๔ เฮิรตซ์ ความเร็วของอนุภาคไม่เกิน ๑๒.๗ มิลลิเมตรต่อวินาที และการจัดไม่เกิน ๐.๕๑ มิลลิเมตร

(๕) ความถี่ ๕ เฮิรตซ์ ความเร็วของอนุภาคไม่เกิน ๑๒.๗ มิลลิเมตรต่อวินาที และการจัดไม่เกิน ๐.๔๐ มิลลิเมตร

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(๘) ความถี่ ๘ เฮิรตซ์ ความเร็วของอนุภาคไม่เกิน ๑๒.๗ มิลลิเมตรต่อวินาที และการจัดไม่เกิน ๐.๒๕ มิลลิเมตร

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ไม่เกิน ๐.๒๐ มิลลิเมตร

(๓๖) ความถี่ ๓๖ เฮิรตซ์ ความเร็วของอนุภาคไม่เกิน ๔๕.๒ มิลลิเมตรต่อวินาที และการจัด
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ไม่เกิน ๐.๒๐ มิลลิเมตร

(๔๐) ความถี่ตั้งแต่ ๔๐ เฮิรตซ์ขึ้นไป ความเร็วของอนุภาคไม่เกิน ๕๐.๘ มิลลิเมตรต่อวินาที
และการจัดไม่เกิน ๐.๒๐ มิลลิเมตร

ข้อ ๗ การตรวจวัดระดับความสั่นสะเทือนจากการทำเหมืองหินให้ทำในบริเวณขอบของ
เขตประทานบัตร หรือเขตประกอบการ หรือขอบด้านนอกของเขตกันชน (Buffer Zone) โดยใช้มาตร
ความสั่นสะเทือนตามมาตรฐานองค์การระหว่างประเทศ ว่าด้วยมาตรฐาน (International Organization
for Standardization) ที่ ISO ๔๘๖๖ โดยการตรวจวัดความสั่นสะเทือนให้เป็นไปตามมาตรฐาน DIN
๔๑๕๐ ซึ่งมีรายละเอียดตามที่กำหนดไว้ในภาคผนวก ๓ท้ายประกาศนี้

ข้อ ๘ ประกาศนี้ให้ใช้บังคับนับตั้งแต่วันถัดจากวันที่ประกาศในราชกิจจานุเบกษาเป็นต้นไป

ประกาศ ณ วันที่ ๗ พฤศจิกายน พ.ศ. ๒๕๔๘

ยงยุทธ คีระไพรัช

รัฐมนตรีว่าการกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม

ภาคผนวก ๑

ท้าย

ประกาศกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม
เรื่อง กำหนดมาตรฐานควบคุมระดับเสียงและความสั่นสะเทือนจากการทำเหมืองหิน

ภาคผนวก ๒

ท้าย

ประกาศกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม
เรื่อง กำหนดมาตรฐานควบคุมระดับเสียงและความสั่นสะเทือนจากการทำเหมืองหิน

วิธีการตรวจวัดระดับเสียง

๑. การวัดระดับเสียงบริเวณภายนอกอาคาร (Outdoor Measurement)

การติดตั้งไมโครโฟนของมาตรฐานระดับเสียงควรห่างจากกำแพง สิ่งปลูกสร้างหรือวัสดุ
ที่ทำให้เกิดการสะท้อนเสียงอย่างน้อย ๓.๕ เมตร และสูงจากพื้น ๑.๒ – ๑.๕ เมตร

๒. การตรวจวัดระดับเสียงบริเวณภายในอาคาร (Indoor Measurement)

การติดตั้งไมโครโฟนของมาตรฐานระดับเสียงควรห่างจากกำแพงอย่างน้อย ๑ เมตร และ
ประมาณ ๑.๕ เมตร จากหน้าต่าง และให้สูงจากพื้น ๑.๒ – ๑.๕ เมตร

การคำนวณค่าระดับเสียงเฉลี่ย (Equivalent Sound Level, L_{eq})

สามารถคำนวณได้ตามสมการ

$$L_{eq} = 10 \log \left[\frac{1}{100} \sum_{i=1}^n f_i 10^{0.1 L_{Ai}} \right]$$

เมื่อ L_{Ai} = ค่าระดับเสียงในหน่วยเดซิเบลเอ ในช่วงเวลาที่ i

f_i = ช่วงเวลาที่ทำการตรวจวัดระดับเสียงช่วงที่ i คิดเป็นร้อยละ
ของเวลาที่ทำการตรวจวัดทั้งหมด

$$= (t_i \times 100) / T$$

โดยที่ t_i = ช่วงเวลาที่ทำการตรวจวัดที่ i คิดเป็นชั่วโมง

$$T = \text{ช่วงเวลาที่ทำการตรวจวัดทั้งหมด} = \sum t_i$$

เมื่อหาค่าระดับเสียงเฉลี่ยทุกชั่วโมงได้ จะหาค่าระดับเสียงเฉลี่ยในช่วงเวลา T ชั่วโมง
ซึ่งสามารถคำนวณได้จากสมการ

$$L_{eq(T)} = 10 \log \left[\frac{1}{T} \sum_{i=1}^n 10^{0.1 L_{eqi}} \right]$$

โดยที่ $L_{eq(T)}$ = ค่าระดับเสียงต่อเนื่องในช่วงเวลา T ชั่วโมง

L_{eqi} = ค่าเฉลี่ยระดับเสียงต่อเนื่อง ๑ ชั่วโมง ในชั่วโมงที่ i

ในกรณีที่ T = ๒๔ ชั่วโมง

$$L_{eq}(24) = 10 \log \left[\frac{1}{24} \sum_{i=1}^n 10^{0.1 L_{eqi}} \right]$$

ในกรณีที่ T = ๘ ชั่วโมง

$$L_{eq}(8) = 10 \log \left[\frac{1}{8} \sum_{i=1}^n 10^{0.1 L_{eqi}} \right]$$

ภาคผนวก ๓

ท้าย

ประกาศกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม

เรื่อง กำหนดมาตรฐานควบคุมระดับเสียงและความสั่นสะเทือนจากการทำเหมืองหิน

วิธีการตรวจวัดความสั่นสะเทือน (DIN ๔๑๕๐)

๑. การติดตั้งหัววัดความสั่นสะเทือนบนพื้นดิน ให้ใช้อุปกรณ์หรือวัสดุอื่นใดมาทำ

การ

ยึดหรือติดตั้งหัววัดความสั่นสะเทือนให้มั่นคง โดยต้องทำให้หัววัดความสั่นสะเทือนไม่สามารถขยับเคลื่อนไหวยจากตำแหน่งที่ติดตั้งในขณะที่ทำการตรวจวัดได้

๒. การติดตั้งหัววัดความสั่นสะเทือนบนฐานคอนกรีตด้านนอกสิ่งก่อสร้าง ให้ทำการตรวจวัดที่บริเวณฐานคอนกรีตที่อยู่ระดับเดียวกับพื้นดิน หรือฐานคอนกรีตที่มีความสูงจากพื้นดินไม่เกิน ๐.๕ เมตร โดยให้ทำการยึดหรือติดตั้งหัววัดความสั่นสะเทือนให้มั่นคง

ภาคผนวก ซ-4

มาตรฐานตามประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ ฉบับที่ 8 (พ.ศ. 2537)
เรื่อง กำหนดมาตรฐานคุณภาพน้ำในแหล่งน้ำผิวดิน ประกาศในราชกิจจานุเบกษา
เล่ม 111 ตอนที่ 16ง วันที่ 24 กุมภาพันธ์ พ.ศ. 2537





ประกาศคณะกรรมการสิ่งแวดล้อมแห่งชาติ
ฉบับที่ ๘ (พ.ศ. ๒๕๓๙)
ออกตามความในพระราชบัญญัติส่งเสริมและรักษาคุณภาพสิ่งแวดล้อมแห่งชาติ
พ.ศ. ๒๕๓๕
เรื่อง กำหนดมาตรฐานคุณภาพน้ำในแหล่งน้ำผิวดิน

อาศัยอำนาจตามความในมาตรา ๓๒ (๑) แห่งพระราชบัญญัติส่งเสริมและรักษาคุณภาพ
สิ่งแวดล้อมแห่งชาติ พ.ศ. ๒๕๓๕ คณะกรรมการสิ่งแวดล้อมแห่งชาติประกาศกำหนด
มาตรฐานคุณภาพน้ำในแหล่งน้ำผิวดิน ไว้ดังต่อไปนี้

หมวด ๑
บททั่วไป

ข้อ ๑ ในประกาศนี้
"แหล่งน้ำผิวดิน" หมายถึง แม่น้ำ ลำคลอง หนอง บึง ทะเลสาบ อ่างเก็บ
น้ำ และแหล่งน้ำสาธารณะอื่นๆ ที่อยู่ภายในดินแดนดิน ซึ่งหมายความรวมถึงแหล่งน้ำ
สาธารณะที่อยู่ภายในดินแดนดินบนเกาะด้วย แต่ไม่รวมถึงน้ำบาดาล และในกรณีแหล่งน้ำ
นั้นอยู่ติดกับทะเลให้หมายความถึงแหล่งน้ำที่อยู่ภายในปากแม่น้ำหรือปากทะเลสาบ
ปากแม่น้ำและปากทะเลสาบให้อธิบายเขตตามที่กรมเจ้าท่ากำหนด

หมวด ๒

ประเภทและมาตรฐานคุณภาพน้ำในแหล่งน้ำผิวดิน

ข้อ ๒ ให้แบ่งแหล่งน้ำผิวดินออกเป็น ๕ ประเภทคือ แหล่งน้ำประเภทที่ ๑ แหล่ง
น้ำประเภทที่ ๒ แหล่งน้ำประเภทที่ ๓ แหล่งน้ำประเภทที่ ๔ และแหล่งน้ำประเภทที่ ๕

(๑) แหล่งน้ำประเภทที่ ๑ ได้แก่ แหล่งน้ำที่คุณภาพน้ำมีสภาพตาม
ธรรมชาติโดยปราศจากน้ำทิ้งจากกิจกรรมทุกประเภทและสามารถเป็นประโยชน์เพื่อ

- (ก) การอุปโภคและบริโภคโดยต้องผ่านการฆ่าเชื้อโรคตามปกติก่อน
- (ข) การขยายพันธุ์ตามธรรมชาติของสิ่งมีชีวิตระดับพื้นฐาน
- (ค) การอนุรักษ์ระบบนิเวศของแหล่งน้ำ

(๒) แหล่งน้ำประเภทที่ ๒ ได้แก่ แหล่งน้ำที่ได้รับน้ำทิ้งจากกิจกรรมบาง
ประเภทและสามารถเป็นประโยชน์เพื่อ

(ก) การอุปโภคและบริโภคโดยต้องผ่านการฆ่าเชื้อโรคตามปกติ
และผ่านกระบวนการปรับปรุงคุณภาพน้ำทั่วไปก่อน

- (ข) การอนุรักษ์สัตว์น้ำ
- (ค) การประมง
- (ง) การว่ายน้ำและกีฬาทางน้ำ

(๓) แหล่งน้ำประเภทที่ ๓ ได้แก่ แหล่งน้ำที่ได้รับน้ำทิ้งจากกิจกรรมบาง
ประเภทและสามารถเป็นประโยชน์เพื่อ

(ก) การอุปโภคและบริโภคโดยต้องผ่านการฆ่าเชื้อโรคตามปกติ
และผ่านกระบวนการปรับปรุงคุณภาพน้ำทั่วไปก่อน

- (ข) การเกษตร

(๔) แหล่งน้ำประเภทที่ ๔ ได้แก่ แหล่งน้ำที่ได้รับน้ำทิ้งจากกิจกรรมบาง
ประเภทและสามารถเป็นประโยชน์เพื่อ

(ก) การอุปโภคและบริโภคโดยต้องผ่านการฆ่าเชื้อโรคตามปกติ
และผ่านกระบวนการปรับปรุงคุณภาพน้ำเป็นพิเศษก่อน

- (ข) การอุตสาหกรรม

(๕) แหล่งน้ำประเภทที่ ๕ ได้แก่ แหล่งน้ำที่ได้รับน้ำทั้งจากกิจกรรมบางประเภท และสามารถเป็นประโยชน์เพื่อการคมนาคม

ข้อ ๓ คุณภาพน้ำในแหล่งน้ำประเภทที่ ๑ ต้องมีสภาพตามธรรมชาติ และสามารถใช้อุปโภคบริโภคตามข้อ ๒ (๑)

ข้อ ๔ คุณภาพน้ำในแหล่งน้ำประเภทที่ ๒ ต้องมีมาตรฐานดังต่อไปนี้

(๑) ไม่มีวัตถุหรือสิ่งของที่เกิดจากการกระทำของมนุษย์ซึ่งจะทำให้ สัตว์กินและรสของน้ำเปลี่ยนไปตามธรรมชาติ

(๒) อุณหภูมิ (Temperature) ไม่สูงกว่าอุณหภูมิมาตรฐานชาติเกิน ๓ องศาเซลเซียส

(๓) ความเป็นกรดและด่าง (pH) มีค่าระหว่าง ๕.๐-๙.๐

(๔) ออกซิเจนละลาย (DO) มีค่าไม่น้อยกว่า ๖.๐ มิลลิกรัมต่อลิตร

(๕) บีโอดี (BOD) มีค่าไม่เกินกว่า ๑.๕ มิลลิกรัมต่อลิตร

(๖) แบคทีเรียกลุ่มโคลิฟอร์มทั้งหมด (Total Coliform Bacteria) มีค่าไม่เกินกว่า ๕,๐๐๐ เอ็ม.พี.เอ็น. ต่อ ๑๐๐ มิลลิลิตร

(๗) แบคทีเรียกลุ่มฟีคัลโคลิฟอร์ม (Fecal Coliform Bacteria) มีค่าไม่เกินกว่า ๑,๐๐๐ เอ็ม.พี.เอ็น. ต่อ ๑๐๐ มิลลิลิตร

(๘) ไนเตรต (NO_3) ในหน่วยไนโตรเจน มีค่าไม่เกินกว่า ๕.๐ มิลลิกรัมต่อลิตร

(๙) แอมโมเนีย (NH_3) ในหน่วยไนโตรเจน มีค่าไม่เกินกว่า ๐.๕ มิลลิกรัมต่อลิตร

(๑๐) ฟีนอล (Phenols) มีค่าไม่เกินกว่า ๐.๐๐๕ มิลลิกรัมต่อลิตร

(๑๑) ทองแดง (Cu) มีค่าไม่เกินกว่า ๐.๑ มิลลิกรัมต่อลิตร

(๑๒) นิกเกิล (Ni) มีค่าไม่เกินกว่า ๐.๑ มิลลิกรัมต่อลิตร

(๑๓) แมงกานีส (Mn) มีค่าไม่เกินกว่า ๐.๑ มิลลิกรัมต่อลิตร

(๑๔) สังกะสี (Zn) มีค่าไม่เกินกว่า ๑.๐ มิลลิกรัมต่อลิตร

(๑๕) แคดเมียม (Cd) ในน้ำที่มีความกระด้างในรูปของ CaCO_3 ไม่เกินกว่า ๑๐๐ มิลลิกรัมต่อลิตร มีค่าไม่เกินกว่า ๐.๐๐๕ มิลลิกรัมต่อลิตร และในน้ำที่มีความกระด้างในรูปของ CaCO_3 เกินกว่า ๑๐๐ มิลลิกรัมต่อลิตร มีค่าไม่เกินกว่า ๐.๐๕ มิลลิกรัมต่อลิตร

(๑๖) โครเมียมชนิดเฮกซะวาเลนต์ (Cr Hexavalent) มีค่าไม่เกินกว่า ๐.๐๕ มิลลิกรัมต่อลิตร

(๑๗) ตะกั่ว (Pb) มีค่าไม่เกิน ๐.๐๕ มิลลิกรัมต่อลิตร

(๑๘)ปรอททั้งหมด (Total Hg) มีค่าไม่เกินกว่า ๐.๐๐๒ มิลลิกรัมต่อลิตร

(๑๙) สารหนู (As) มีค่าไม่เกินกว่า ๐.๐๑ มิลลิกรัมต่อลิตร

(๒๐) ไซยาไนด์ (Cyanide) มีค่าไม่เกินกว่า ๐.๐๐๕ มิลลิกรัมต่อลิตร

(๒๑) ถ้ามัณฑภาพรังสี (Radioactivity) มีค่ารังสีแอลฟา (Alpha) ไม่เกินกว่า ๐.๑ เบกเกอร์เรลต่อลิตร และรังสีเบตา (Beta) ไม่เกินกว่า ๑.๐ เบกเกอร์เรลต่อลิตร

(๒๒) สารฆ่าศัตรูพืชและสัตว์ชนิดที่มีคลอรีนทั้งหมด (Total Organochlorine Pesticides) มีค่าไม่เกินกว่า ๐.๐๕ มิลลิกรัมต่อลิตร

(๒๓) ดีดีที (DDT) มีค่าไม่เกินกว่า ๑.๐ ไมโครกรัมต่อลิตร

(๒๔) บีเอชซีชนิดแอลฟา (Alpha-BHC) มีค่าไม่เกินกว่า ๐.๐๒ ไมโครกรัมต่อลิตร

(๒๕) ดีลด์ริน (Dieldrin) มีค่าไม่เกินกว่า ๐.๑ ไมโครกรัมต่อลิตร

(๒๖) อัลดริน (Aldrin) มีค่าไม่เกินกว่า ๐.๑ ไมโครกรัมต่อลิตร

(๒๗) เฮปตาคลอร์ (Heptachlor) และเฮปตาคลอร์อีปอกไซด์ (Heptachlorepoxyde) มีค่าไม่เกินกว่า ๐.๒ ไมโครกรัมต่อลิตร

(๒๘) เอนดริน (Endrin) ไม่สามารถตรวจพบได้ตามวิธีการตรวจสอบที่กำหนด

ข้อ ๕ คุณภาพน้ำในแหล่งน้ำประเภทที่ ๓ ต้องมีมาตรฐานตาม ข้อ ๔ เว้นแต่

(๑) ออกซิเจนละลาย มีค่าไม่น้อยกว่า ๔.๐ มิลลิกรัมต่อลิตร

(๒) บีโอดี มีค่าไม่เกินกว่า ๒.๐ มิลลิกรัมต่อลิตร

(๓) แบคทีเรียกลุ่มโคลิฟอร์มทั้งหมด มีค่าไม่เกินกว่า ๒๐,๐๐๐ เอ็ม.พี.เอ็น. ต่อ ๑๐๐ มิลลิลิตร

(๔) แบคทีเรียกลุ่มฟีคัลโคลิฟอร์ม มีค่าไม่เกินกว่า ๔,๐๐๐ เอ็ม.พี.เอ็น. ต่อ ๑๐๐ มิลลิลิตร

ข้อ ๖ คุณภาพน้ำในแหล่งน้ำประเภทที่ ๔ ต้องมีมาตรฐานตามข้อ ๔ (๑) ถึง (๕) และ (๘) ถึง (๒๘) เว้นแต่

(๑) ออกซิเจนละลาย มีค่าไม่น้อยกว่า ๒.๐ มิลลิกรัมต่อลิตร

(๒) มีไอดี มีค่าไม่เกินกว่า ๕.๐ มิลลิกรัมต่อลิตร

ข้อ ๘ คุณภาพน้ำในแหล่งน้ำประเภทที่ ๕ ต้องมีมาตรฐานต่ำกว่าคุณภาพน้ำ ใน แหล่งน้ำประเภทที่ ๔

ข้อ ๙ การกำหนดให้แหล่งน้ำผิวดินแหล่งใดแหล่งหนึ่งเป็นประเภทใดตามข้อ ๒ ให้เป็นไปตามที่กรมควบคุมมลพิษประกาศในราชกิจจานุเบกษา

หมวด ๓

วิธีการเก็บตัวอย่างและตรวจสอบคุณภาพน้ำในแหล่งน้ำผิวดิน

ข้อ ๕ การเก็บตัวอย่างน้ำเพื่อตรวจสอบคุณภาพตามข้อ ๓ ถึง ข้อ ๘ ให้ใช้วิธีการ ดังต่อไปนี้

(๑) แหล่งน้ำไหล ซึ่งได้แก่ แม่น้ำ ลำคลอง เป็นต้น ให้เก็บที่จุดกึ่งกลาง ความกว้างของแหล่งน้ำที่ระดับกึ่งกลางความลึก ณ จุดตรวจสอบ เว้นแต่แบบที่เรียกกลุ่ม โคลิฟอร์มทั้งหมดและแบบที่เรียกกลุ่มฟีคอลโคลิฟอร์ม ให้เก็บที่ระดับความลึก ๓๐ เซนติเมตร ณ จุดตรวจสอบ

(๒) แหล่งน้ำนิ่ง ซึ่งได้แก่ ทะเลสาบ หนอง บึง อ่างเก็บน้ำ เป็นต้น ให้ เก็บที่ระดับความลึก ๑ เมตร ณ จุดตรวจสอบสำหรับแหล่งน้ำที่มีความลึกเกินกว่า ๒ เมตร และให้เก็บที่จุดกึ่งกลางความลึก ณ จุดตรวจสอบสำหรับแหล่งน้ำที่มีความลึกไม่เกิน ๒ เมตร เว้นแต่แบบที่เรียกกลุ่มฟีคอลโคลิฟอร์มทั้งหมดและแบบที่เรียกกลุ่มฟีคอลโคลิฟอร์ม ให้เก็บที่ระดับ ความลึก ๓๐ เซนติเมตร ณ จุดตรวจสอบ

จุดตรวจสอบตาม (๑) และ (๒) ของแหล่งน้ำที่กำหนดตามข้อ ๔ ให้เป็นไปตามที่ กรมควบคุมมลพิษกำหนด

ข้อ ๑๐ การตรวจสอบคุณภาพน้ำตามข้อ ๓ ถึงข้อ ๘ ให้ใช้วิธีการดังต่อไปนี้

(๑) การตรวจสอบอุณหภูมิ ให้ใช้เครื่องมืออุณหภูมิ (Thermometer) วัดขณะ ทำการเก็บตัวอย่างน้ำ

(๒) การตรวจสอบค่าความเป็นกรดและด่าง ให้ใช้เครื่องมือวัดความเป็นกรด และด่างของน้ำ (pH meter) ตามวิธีการหาค่าแบบอิเล็กโตรเมตริก (Electrometric)

(๓) การตรวจสอบค่าออกซิเจนละลาย ให้ใช้วิธีอะไซด์โมดิฟิเคชัน (Azide Modification)

(๔) การตรวจสอบค่าบีโอดี ให้ใช้วิธีอะไซด์โมดิฟิเคชัน (Azide Modification) ที่อุณหภูมิ ๒๐ องศาเซลเซียส เป็นเวลา ๕ วันติดต่อกัน

(๕) การตรวจสอบค่าแบคทีเรียกลุ่มโคลิฟอร์มทั้งหมดและค่าแบคทีเรียกลุ่ม ฟีคอลโคลิฟอร์ม ให้ใช้วิธีมัลติเทสต์ ทิวบ์ เฟอเรนเดชัน เทกนิค (Multiple Tube Fermentation Technique)

(๖) การตรวจสอบค่าไนเตรดในหน่วยไนโตรเจน ให้ใช้วิธีแคดเมียม รีดักชัน (Cadmium Reduction)

(๗) การตรวจสอบค่าแอมโมเนียในหน่วยไนโตรเจน ให้ใช้วิธีดิสทิลเลชัน เมสเสอร์ไรเซชัน (Distillation Nesslerization)

(๘) การตรวจสอบค่าฟีนอล ให้ใช้วิธีดิสทิลเลชัน ๔ - อะมิโนแอนติไพรีน (Distillation, 4-Amino antipyrine)

(๙) การตรวจสอบค่าทองแดง นิกเกิล แมงกานีส สังกะสี แคดเมียม โครเมียมซนิคเฮกซาวาเลนต์ และตะกั่ว ให้ใช้วิธีอะตอมมิก แอซพเรชัน ไดเร็ก แอสไพเรชัน (Atomic Absorption - Direct Aspiration)

(๑๐) การตรวจสอบค่าปรอททั้งหมด ให้ใช้วิธีอะตอมมิก แอซพเรชัน โกลด์ เวเปอร์ เทกนิค (Atomic Absorption-Cold Vapour Technique)

(๑๑) การตรวจสอบค่าสารหนู ให้ใช้วิธีอะตอมมิก แอซพเรชัน แก๊สซัส ไฮไดรด์ (Atomic Absorption - Gaseous Hydride)

(๑๒) การตรวจสอบค่าไซยาไนด์ ให้ใช้วิธีไพรีดีน บาร์บิทูริก แอซิด (Pyridine - Barbituric Acid)

(๑๓) การตรวจสอบค่ากัมมันตภาพรังสี ให้ใช้วิธีโลว์ แบ็กกราวด์ พร็อพอร์ชันนอล คานาเคอร์ (Low Background Proportional Counter)

(๑๔) การตรวจค่าสารฆ่าศัตรูพืชและสัตว์ชนิดที่มีคลอรีนทั้งหมด คีลิที บิเอชซีชนิดแอลฟา คีลควิน อัลควิน เฮปตาคลอโรอีพอกไซด์ และเอนควิน ให้ใช้วิธีแก๊ส - โครมาโตกราฟี (Gas - Chromatography)

ข้อ ๑๑ การตรวจสอบค่าออกซิเจนละลายให้ใช้ค่าเปอร์เซ็นต์ไทล์ที่ ๒๐ (20th Percentile Value) ส่วนการตรวจสอบค่าบีโอดี แบบที่เรียกกลุ่มโคลิฟอร์มทั้งหมด และแบบที่เรียกกลุ่ม ฟีคอลโคลิฟอร์ม ให้ใช้ค่าเปอร์เซ็นต์ไทล์ที่ ๙๐ โดยจำนวนและระยะเวลาสำหรับการเก็บ ตัวอย่างน้ำดังกล่าว ให้เป็นไปตามที่กรมควบคุมมลพิษกำหนด

ข้อ ๑๒ การเก็บตัวอย่างน้ำตามข้อ ๕ และการตรวจสอบคุณภาพน้ำตามข้อ ๑๐ จะต้องเป็นไปตามวิธีการมาตรฐานสำหรับการวิเคราะห์น้ำและน้ำเสีย (Standard Methods for Examination of Water and Wastewater) ซึ่ง American Public Health Association และ American Water Works Association กับ Water Pollution Control Federation ของสหรัฐอเมริกา ร่วมกันกำหนดไว้ด้วย

ประกาศ ณ วันที่ ๒๐ มกราคม พ.ศ. ๒๕๓๖
ชวน หลีกภัย
นายกรัฐมนตรี
ประธานคณะกรรมการสิ่งแวดล้อมแห่งชาติ

(ประกาศในราชกิจจานุเบกษา เล่ม ๑๑๐ ตอนที่ ๑๖ ง วันที่ ๒๕ กุมภาพันธ์ ๒๕๓๖)

ภาคผนวก ซ-5

มาตรฐานตามประกาศกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม
เรื่อง กำหนดหลักเกณฑ์และมาตรการในทางวิชาการสำหรับการป้องกัน

ด้านสาธารณสุขและการป้องกันในเรื่องสิ่งแวดล้อมเป็นพิษ

ประกาศในราชกิจจานุเบกษา เล่ม 125 ตอนพิเศษ 85 ง วันที่ 21 พฤษภาคม พ.ศ. 2551



ประกาศกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม

เรื่อง กำหนดหลักเกณฑ์และมาตรการในทางวิชาการสำหรับการป้องกัน

ด้านสาธารณสุขและการป้องกันในเรื่องสิ่งแวดล้อมเป็นพิษ

พ.ศ. ๒๕๕๑

ด้วยปัจจุบัน กรมทรัพยากรน้ำบาดาล ได้ส่งเสริมและพัฒนาความรู้ความสามารถของช่างเจาะน้ำบาดาลทั้งของรัฐและเอกชน ให้มีประสิทธิภาพเพียงพอด้านวิชาการน้ำบาดาล จึงสมควรปรับปรุงหลักเกณฑ์การใช้น้ำบาดาลให้เหมาะสมและสอดคล้องกับสถานการณ์ในปัจจุบัน ฉะนั้น อาศัยอำนาจตามความในมาตรา ๖ (๑) แห่งพระราชบัญญัติน้ำบาดาล พ.ศ. ๒๕๒๐ รัฐมนตรีว่าการกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม โดยคำแนะนำของคณะกรรมการน้ำบาดาล ออกประกาศกำหนดหลักเกณฑ์และมาตรการในทางวิชาการสำหรับการป้องกันด้านสาธารณสุขและการป้องกันในเรื่องสิ่งแวดล้อมเป็นพิษไว้ ดังต่อไปนี้

ข้อ ๑ ให้ยกเลิกประกาศกระทรวงอุตสาหกรรม ฉบับที่ ๑๒ (พ.ศ. ๒๕๔๒) ออกตามความในพระราชบัญญัติน้ำบาดาล พ.ศ. ๒๕๒๐

ข้อ ๒ การป้องกันน้ำภายนอกไหลลงบ่อน้ำบาดาล

(๑) บ่อน้ำบาดาลทุกบ่อ ต้องผนึกข้างบ่อดั้งแต่ตอนบนสุดนับจากผิวดินลึกลงไปไม่น้อยกว่า ๖ เมตร ด้วยซีเมนต์ล้วนหรือซีเมนต์ผสมทราย เพื่อป้องกันมิให้น้ำภายนอกไหลซึมลงข้างบ่อ

(๒) ในกรณีที่บ่อน้ำบาดาลอยู่ในที่ลุ่มหรืออยู่ต่ำกว่าบริเวณข้างเคียงจะต้องปรับบริเวณที่ตั้งบ่อให้สูงกว่าบริเวณข้างเคียงเพื่อป้องกันมิให้น้ำจากภายนอกไหลเข้ามาในบริเวณที่ตั้งบ่อ

(๓) ในกรณีที่บ่อน้ำบาดาลติดตั้งเครื่องสูบน้ำไฟฟ้า ต้องทำลานคอนกรีตเป็นชานบ่อรอบปากบ่อน้ำบาดาลหนาไม่น้อยกว่า ๑๕ เซนติเมตร พื้นที่ไม่น้อยกว่า ๑ ตารางเมตร ส่วนในกรณีที่บ่อน้ำบาดาลติดตั้งเครื่องสูบน้ำมือโยก ต้องทำลานคอนกรีตเป็นชานบ่อรอบปากบ่อน้ำบาดาลหนาไม่น้อยกว่า ๑๕ เซนติเมตร พื้นที่ไม่น้อยกว่า ๔ ตารางเมตร และรอบชานบ่อจะต้องมีทางระบายน้ำออกจากบริเวณบ่อ

(๔) ในกรณีที่จะระงับการใช้น้ำบาดาลชั่วคราวโดยการถอดถอนเครื่องสูบน้ำออกไป จะต้องปิดปากบ่อให้แน่นหนา เพื่อป้องกันมิให้สิ่งหนึ่งสิ่งใดตกลงไปในบ่อ

ข้อ ๓ คุณภาพของน้ำบาดาลที่จะใช้บริโภคได้

(๑) น้ำบาดาลที่จะใช้บริโภคต้องเป็นน้ำที่ได้ผ่านการวิเคราะห์คุณสมบัติจากกรมทรัพยากรน้ำบาดาลหรือส่วนราชการอื่น หรือองค์การของรัฐที่มีหน้าที่เกี่ยวกับการวิเคราะห์คุณสมบัติของน้ำ หรือสถาบันอื่นที่ได้รับการรับรองคุณภาพมาตรฐาน มอก. 1300 - 2537 (ISO / IEC Guide 25) หรือสถาบันที่กรมทรัพยากรน้ำบาดาลให้ความเห็นชอบตามหลักเกณฑ์ วิธีการ และเงื่อนไขที่กรมทรัพยากรน้ำบาดาลกำหนด

(๒) น้ำบาดาลที่จะใช้บริโภค ต้องเป็นน้ำบาดาลที่มีคุณลักษณะทางกายภาพ และคุณลักษณะทางเคมีไม่เกินเกณฑ์อนุโลมสูงสุดตามที่กำหนดไว้ในมาตรฐานน้ำบาดาลที่จะใช้บริโภคได้ ท้ายประกาศนี้

(๓) ในท้องที่ที่กรมทรัพยากรน้ำบาดาลกำหนด ต้องทำการวิเคราะห์หาคุณลักษณะที่เป็นพิษโดยให้มีปริมาณไม่เกินเกณฑ์อนุโลมสูงสุดตามที่กำหนดไว้ในมาตรฐานน้ำบาดาล ที่จะใช้บริโภคได้ ท้ายประกาศนี้

(๔) ในกรณีที่มีความจำเป็นกรมทรัพยากรน้ำบาดาล อาจสั่งให้วิเคราะห์คุณลักษณะทางแบคทีเรีย/แบคทีเรียก็ได้ โดยต้องมีคุณลักษณะทางแบคทีเรีย/แบคทีเรีย ไม่เกินเกณฑ์กำหนดที่เหมาะสมตามที่กำหนดไว้ท้ายประกาศนี้

ข้อ ๔ การฆ่าจุลินทรีย์ในบ่อน้ำบาดาล

(๑) หลังการเจาะน้ำบาดาล หรือหลังการติดตั้งเครื่องสูบน้ำบาดาล หรือหลังการซ่อมส่วนประกอบของเครื่องสูบน้ำบาดาลที่อยู่ในบ่อน้ำบาดาล ต้องทำการฆ่าจุลินทรีย์ในบ่อน้ำบาดาลที่จะใช้น้ำเพื่อการอุปโภคบริโภค

(๒) การฆ่าเชื้อจุลินทรีย์ในบ่อน้ำบาดาลให้กระทำโดยการกวนน้ำในบ่อน้ำบาดาล โดยใช้ปูนคลอรีน หรือก๊าซคลอรีน เป็นตัวฆ่าเชื้อจุลินทรีย์ โดยให้ความเข้มข้นของคลอรีนไม่น้อยกว่า ๕๐ มิลลิกรัมต่อลิตร

(๓) ภายหลังการกวนน้ำในบ่อน้ำบาดาลตาม (๒) ต้องปล่อยทิ้งไว้ไม่น้อยกว่า ๑๒ ชั่วโมง แล้วสูบน้ำในบ่อน้ำบาดาลออกทั้งหมดคลื่อนคลอรีน

ข้อ ๕ เครื่องสูบน้ำบาดาล

(๑) ต้องล้างอุปกรณ์หรือชิ้นส่วนของเครื่องสูบน้ำให้สะอาดก่อนใส่ลงไปในบ่อน้ำบาดาล

(๒) ในการติดตั้งเครื่องสูบน้ำทุกชนิด จะต้องอุดช่องที่ปากบ่อน้ำบาดลระหว่างเครื่องสูบน้ำกับตัวบ่อน้ำบาดลให้แน่น เพื่อป้องกันมิให้น้ำ หรือมลสารอื่นใดจากภายนอกเข้าไปในบ่อน้ำบาดลได้

ข้อ ๖ การเลิกใช้น้ำบาดล

(๑) บ่อน้ำบาดลที่เลิกใช้แล้ว ต้องอุดกลบด้วยซีเมนต์หรือดินเหนียวบริสุทธิ์ หรือวัสดุอื่นตามที่กรมทรัพยากรน้ำบาดลกำหนด โดยคำแนะนำของคณะกรรมการน้ำบาดล

การอุดกลบบ่อน้ำบาดลด้วยวัสดุตามวรรคหนึ่ง ต้องอุดกลบตั้งแต่กันบ่อจนถึงปากบ่อตามหลักเกณฑ์ วิธีการ และเงื่อนไขที่กรมทรัพยากรน้ำบาดลกำหนด โดยมีช่างเจาะน้ำบาดลเป็นผู้ควบคุม รับผิดชอบในการอุดกลบบ่อน้ำบาดล ทั้งนี้ ต้องดำเนินการภายใต้การกำกับ ดูแลของพนักงานน้ำบาดลประจำท้องที่ หรือพนักงานเจ้าหน้าที่ผู้ซึ่งพนักงานน้ำบาดลประจำท้องที่มอบหมาย

(๒) ช่างเจาะน้ำบาดลตาม (๑) ต้องเป็นผู้ที่อธิบดีกรมทรัพยากรน้ำบาดล ออกหนังสือรับรองให้ ตามหลักเกณฑ์ วิธีการ และเงื่อนไขที่อธิบดีกรมทรัพยากรน้ำบาดลกำหนด

(๓) ต้องจัดทำรายงานการอุดกลบบ่อน้ำบาดล ตามแบบที่กรมทรัพยากรน้ำบาดลกำหนด แล้วส่งรายงานดังกล่าวให้พนักงานน้ำบาดลประจำท้องที่ภายใน ๗ วัน นับแต่วันอุดกลบบ่อน้ำบาดลแล้วเสร็จ

ประกาศ ณ วันที่ ๒๔ มีนาคม พ.ศ. ๒๕๕๑
องคัวรรณ เทพสุทิน
รัฐมนตรีว่าการกระทรวงทรัพยากรธรรมชาติและสิ่งแวดล้อม

มาตรฐานน้ำบาดลที่จะใช้บริโภคได้

คุณลักษณะทางกายภาพ

รายการ	เกณฑ์กำหนดที่เหมาะสม	เกณฑ์อนุโลมสูงสุด
สี (Color)	5 (หน่วยแพลทินัม-โคบอลต์)	15 (หน่วยแพลทินัม-โคบอลต์)
ความขุ่น (Turbidity)	5 (หน่วยความขุ่น)	20 (หน่วยความขุ่น)
ความเป็นกรด-ด่าง (pH)	7.0-8.5	6.5-9.2

คุณลักษณะทางเคมี

รายการ	เกณฑ์กำหนดที่เหมาะสม (มิลลิกรัมต่อลิตร)	เกณฑ์อนุโลมสูงสุด (มิลลิกรัมต่อลิตร)
เหล็ก (Fe)	ไม่เกิน 0.5	1.0
แมงกานีส (Mn)	ไม่เกิน 0.3	0.5
ทองแดง (Cu)	ไม่เกิน 1.0	1.5
สังกะสี (Zn)	ไม่เกิน 5.0	15
ซัลเฟต (SO ₄)	ไม่เกิน 200	250
คลอไรด์ (Cl)	ไม่เกิน 250	600
ฟลูออไรด์ (F)	ไม่เกิน 0.7	1.0
ไนเตรท (NO ₃)	ไม่เกิน 45	45
ความกระด้างทั้งหมด (Total hardness as CaCO ₃)	ไม่เกิน 300	500
ความกระด้างถาวร (Non-carbonate hardness as CaCO ₃)	ไม่เกิน 200	250
ปริมาณมลสารทั้งหมดที่ละลายได้ (Total dissolved solids)	ไม่เกิน 600	1,200

คุณลักษณะที่เป็นพิษ

รายการ	เกณฑ์กำหนดที่เหมาะสม (มิลลิกรัมต่อลิตร)	เกณฑ์อนุโลมสูงสุด (มิลลิกรัมต่อลิตร)
สารหนู (As)	ต้องไม่มี	0.05
ไซยาไนด์ (CN)	ต้องไม่มี	0.1
ตะกั่ว(Pb)	ต้องไม่มี	0.05
ปรอท(Hg)	ต้องไม่มี	0.001
แคดเมียม(Cd)	ต้องไม่มี	0.01
ซีลีเนียม(Se)	ต้องไม่มี	0.01

คุณลักษณะทางแบคทีรี/แบคทีเรีย

รายการ	เกณฑ์กำหนดที่เหมาะสม
Standard plate count	ไม่เกิน 500 โคโลนีต่อลูกบาศก์เซนติเมตร
Most probable number of Coliform organism (MPN)	น้อยกว่า 2.2 ต่อร้อยลูกบาศก์เซนติเมตร
E. coli	ต้องไม่มี

หมายเหตุ :- เหตุผลในการประกาศใช้ประกาศฉบับนี้ คือ เนื่องจากหลักเกณฑ์ และมาตรการในทางวิชาการ สำหรับการป้องกันด้านสาธารณสุขและการป้องกันในเรื่องสิ่งแวดล้อมเป็นพิษ ตามประกาศกระทรวงอุตสาหกรรม ฉบับที่ ๑๒ (พ.ศ. ๒๕๔๒) ออกตามความในพระราชบัญญัติน้ำบาดาล พ.ศ. ๒๕๒๐ สมควรปรับปรุงหลักเกณฑ์ การใช้น้ำบาดาลให้มีความเหมาะสม และสอดคล้องกับสถานการณ์ในปัจจุบัน โดยกำหนด ผู้ควบคุมการอุกกลบ บ่อน้ำบาดาลตามขนาดของบ่อน้ำบาดาล ตลอดจนปรับปรุงข้อความให้มีความถูกต้องตามมาตรา ๗ ทวิ และมาตรา ๗ ศรี แห่งพระราชบัญญัติน้ำบาดาล พ.ศ. ๒๕๒๐ จึงจำเป็นต้องออกประกาศกระทรวงนี้

ภาคผนวก ณ
เอกสารสอบเทียบเครื่องมือ



List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Tisch Environmental, Inc.	TE-5025A 3541	Jiranatee Associates Co., Ltd.	COF-046-67	5 Nov 24	4 Nov 25	-
2	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Tisch Environmental, Inc.	TE-5025A 3540	Jiranatee Associates Co., Ltd.	COF-045-67	5 Nov 24	4 Nov 25	-
3	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Tisch Environmental, Inc.	TE-5025A 3383	Jiranatee Associates Co., Ltd.	COF-039-67	27 Sep 24	26 Sep 25	-
4	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	24P1252	11 Apr 24	10 Apr 25	-
5	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	25P112	19 Feb 25	18 Feb 26	-
6	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1369	22 Apr 24	21 Apr 25	-
7	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5})	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1367	22 Apr 24	21 Apr 25	-
8	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1857	4 Jun 24	3 Jun 25	-
9	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	25P1380	17 Apr 25	16 Apr 26	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
10	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H757	10 Apr 24	9 Apr 25	-
11	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5})	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H753	10 Apr 24	9 Apr 25	-
12	Digital Thermo - Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Digicon	TH-02 435031147	Technology Promotion Association (Thailand-Japan)	24H1486	15 Jul 24	14 Jul 25	-
13	Digital Thermo - Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀) Particular Matter (PM _{2.5})	Digicon	-	Technology Promotion Association (Thailand-Japan)	25H806	10 Apr 25	9 Apr 26	-
14	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM12394	Calibration Laboratory Co.Ltd	Q24059619	11 Jun 24	10 Jun 25	-
15	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM12395	Calibration Laboratory Co.Ltd	Q24042942	30 Apr 24	29 Apr 25	-
16	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM11355	Calibration Laboratory Co.Ltd	Q24059622	11 Jun 24	10 Jun 25	-
17	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM12888	Calibration Laboratory Co.Ltd	Q24042943	30 Apr 24	29 Apr 25	-
18	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM12889	Calibration Laboratory Co.Ltd	Q24059620	11 Jun 24	10 Jun 25	-
19	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM13368	Calibration Laboratory Co.Ltd	Q24050332	17 May 24	16 May 25	-
20	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM11056	Calibration Laboratory Co.Ltd	Q24037351	8 Apr 24	7 Apr 25	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
21	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM11057	Calibration Laboratory Co.Ltd	Q24042939	30 Apr 24	29 Apr 25	-
22	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM11058	Calibration Laboratory Co.Ltd	Q24037354	8 Apr 24	7 Apr 25	-
23	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM11059	Calibration Laboratory Co.Ltd	Q24037352	8 Apr 24	7 Apr 25	-
24	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14547	Calibration Laboratory Co.Ltd	Q24042940	30 Apr 24	29 Apr 25	-
25	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14105	Calibration Laboratory Co.Ltd	Q24042941	30 Apr 24	29 Apr 25	-
26	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM12865	Calibration Laboratory Co.Ltd	Q24135551A1	20 Dec 24	19 Dec 25	-
27	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM13539	Calibration Laboratory Co.Ltd	Q24135552A1	20 Dec 24	19 Dec 25	-
28	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM11058	Calibration Laboratory Co.Ltd	Q25038315	1 Apr 25	31 Mar 26	-
29	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM11060	Calibration Laboratory Co.Ltd	Q25038316	1 Apr 25	31 Mar 26	-
30	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14546	Calibration Laboratory Co.Ltd	Q24127999A1	4 Dec 24	3 Dec 25	-
31	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14465	Calibration Laboratory Co.Ltd	Q25038318	1 Apr 25	31 Mar 26	-
32	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14466	Calibration Laboratory Co.Ltd	Q24128001A1	4 Dec 24	3 Dec 25	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
33	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14467	Calibration Laboratory Co.Ltd	Q2412800A1	4 Dec 24	3 Dec 25	-
34	Vibration Meter	Vibration Level Acceleration Level	Instantel Inc.	Micromate UM14469	Calibration Laboratory Co.Ltd	Q25038317	1 Apr 25	31 Mar 26	-
35	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Larson Davis	CAL150 6171	Innovative Instrument Co.,Ltd.	24-ACT-086	25 Jun 24	24 Jun 25	-
36	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Svantek	SV35A 73246	Innovative Instrument Co.,Ltd.	24-ACT-077	30 May 24	29 May 25	-
37	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Larson Davis	CAL150 6307	Innovative Instrument Co.,Ltd.	24-ACT-120	10 Sep 24	9 Sep 25	-
38	Sound Level Meter	$L_{Aeq} 1 hr$ $L_{Aeq} 24 hrs$ L_{Amax} L_{g00}	Larson Davis	LX72 0005299	Innovative Instrument Co.,Ltd.	24-SLM-240	11 Jul 24	10 Jul 25	-
39	Sound Level Meter	$L_{Aeq} 1 hr$ $L_{Aeq} 24 hrs$ L_{Amax} L_{g00}	Larson Davis	LX72 0005372	Innovative Instrument Co.,Ltd.	24-SLM-229	9 Jul 24	8 Jul 25	-
40	Sound Level Meter	$L_{Aeq} 1 hr$ $L_{Aeq} 24 hrs$ L_{Amax} L_{g00}	Larson Davis	LX72 0005286	Innovative Instrument Co.,Ltd.	24-SLM-234	10 Jul 24	9 Jul 25	-
41	Sound Level Meter	$L_{Aeq} 1 hr$ $L_{Aeq} 24 hrs$ L_{Amax} L_{g00}	Larson Davis	LX72 0005290	Innovative Instrument Co.,Ltd.	24-SLM-238	11 Jul 24	10 Jul 25	-
42	Sound Level Meter	$L_{Aeq} 1 hr$ $L_{Aeq} 24 hrs$ L_{Amax} L_{g00}	Larson Davis	LX72 0005293	Innovative Instrument Co.,Ltd.	24-SLM-231	10 Jul 24	9 Jul 25	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
43	Sound Level Meter	$L_{Aeq,1hr}$, $L_{Aeq,24hrs}$, L_{Amax} , L_{A90}	Larson Davis	LxT2 0005341	Innovative Instrument Co.,Ltd.	24-SLM-232	10 Jul 24	9 Jul 25	-
44	Sound Level Meter	$L_{Aeq,1hr}$, $L_{Aeq,24hrs}$, L_{Amax} , L_{A90}	Larson Davis	LxT2 0005346	Innovative Instrument Co.,Ltd.	24-SLM-235	10 Jul 24	9 Jul 25	-
45	Sound Level Meter	$L_{Aeq,1hr}$, $L_{Aeq,24hrs}$, L_{Amax} , L_{A90}	Larson Davis	LxT2 0005348	Electrical And Electronics Institute Foundation For Industrial Development	CP20240292EA	6 Aug 24	5 Aug 25	-
46	Sound Level Meter	$L_{Aeq,24hrs}$, L_{Amax} , L_{A90} , L_{Azh}	Larson Davis	LxT2 0006692	Innovative Instrument Co.,Ltd.	24-SLM-228	9 Jul 24	8 Jul 25	-
47	Sound Level Meter	$L_{Aeq,24hrs}$, L_{Amax} , L_{A90} , L_{Azh}	Larson Davis	LxT2 0006756	Innovative Instrument Co.,Ltd.	24-SLM-239	11 Jul 24	10 Jul 25	-
48	Sound Level Meter	$L_{Aeq,24hrs}$, L_{Amax} , L_{A90} , L_{Azh}	Larson Davis	LxT2 0005398	Innovative Instrument Co.,Ltd.	24-SLM-214	2 Jul 24	1 Jul 25	

CERTIFICATE OF CALIBRATION

Certificate No. : COF-046-67

Page 1 of 2 Pages

MEASUREMENT ITEM
MANUFACTURER : Top Load Orifice
MODEL/TYPE : TISCH
SERIAL NUMBER : TE-5025A
ID NUMBER : 3541
CONDITION AS-RECEIVED : UAL-EM-177/2561
CUSTOMER : Used item
United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong,
Bangkok 10260

RECEIVED DATE : 24 Oct 2024
MEASUREMENT DATE : 04 Nov 2024
ISSUE DATE : 05 Nov 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 23.7 °C and 49.7 %RH.

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:
The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model GSG/MC/WZhp. The WP-CL-004 was used as a calibration guideline.

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

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

Calibrated by:
☐ Mr. Sornwet Thachalad
☒ Miss Atthaporn Lertsomphol

Approved signature:
Mr. Parinya Booncharoen
Calibration Department Manager

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

เอกสารไม่ควบคุม

CERTIFICATE OF CALIBRATION

Certificate No. : COF-045-67

Page 1 of 2 Pages

MEASUREMENT ITEM
MANUFACTURER : Top Load Orifice
MODEL/TYPE : TISCH
SERIAL NUMBER : TE-5025A
ID NUMBER : 3540
CONDITION AS-RECEIVED : UAL-EM-176/2561
CUSTOMER : Used item
United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Phrakhanong,
Bangkok 10260

RECEIVED DATE : 24 Oct 2024
MEASUREMENT DATE : 04 Nov 2024
ISSUE DATE : 05 Nov 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1010 ± 10 hPa

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 23.7 °C and 49.7 %RH.

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:
The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model GSG/MC/WZhp. The WP-CL-004 was used as a calibration guideline.

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

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

Calibrated by:
☐ Mr. Sornwet Thachalad
☒ Miss Atthaporn Lertsomphol

Approved signature:
Mr. Parinya Booncharoen
Calibration Department Manager

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

เอกสารไม่ควบคุม

MEASUREMENT RESULTS:

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

Table 1: The results of Q Standard calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Ap_meter mmHg	Ap_Orifice mmHg	Y	Standard Flow [Q_s] m^3/min
1	0.702	755.241	23.67	22.27	57.134	1.612	1.268	0.652
2	1.000	755.312	23.55	22.71	61.321	1.248	1.801	0.920
3	1.117	755.234	23.36	22.73	41.180	4.806	2.075	1.057
4	1.363	755.361	23.37	22.77	30.028	4.806	2.372	1.119
5	1.417	755.397	23.65	23.10	29.199	7.191	2.680	1.363

Slope (m): 1.98270
Intercept (b): -0.02316
Correlation coefficient (r): 0.99988
Uncertainty (k=2): 0.015 m^3/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Ap_meter mmHg	Ap_Orifice mmHg	Y	Standard Flow [Q_s] m^3/min
1	0.702	755.241	23.67	22.27	57.134	1.612	0.736	0.652
2	1.000	755.312	23.55	22.71	61.321	1.248	1.129	0.921
3	1.117	755.234	23.36	22.72	41.180	4.809	1.801	1.058
4	1.363	755.361	23.37	22.77	30.028	4.806	1.374	1.119
5	1.417	755.397	23.65	23.10	29.199	7.191	1.681	1.365

Slope (m): 1.24186
Intercept (b): -0.01454
Correlation coefficient (r): 0.99988
Uncertainty (k=2): 0.015 m^3/min

End of Certificate of Calibration

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CERTIFICATE OF CALIBRATION

Certificate No. : COF-039-67

Page 1 of 2 Pages

MEASUREMENT ITEM
: Top Load Orifice
MANUFACTURER
: TSCH
MODEL/TYPE
: TE-S025A
SERIAL NUMBER
: 3383
ID NUMBER
: UAE-EFM-063/2560
CONDITION AS-RECEIVED
: Used item
CUSTOMER
: United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong,
Bangkok 10260

RECEIVED DATE
: 16 Sep 2024
MEASUREMENT DATE
: 27 Sep 2024
ISSUE DATE
: 27 Sep 2024

ENVIRONMENTAL CONDITIONS:
Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1020 ± 30 hPa

CALIBRATION CONDITION:
Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 23.9 °C and 45.0 %RH.

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

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

Calibration procedure:
The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model GSE/INAC/WO-dp. The INAC CL-004 was used as a calibration guideline.

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

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

MEASUREMENT RESULTS:

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

Table 1: The results of Q Standard calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Ap_meter mmHg	Ap_Orifice inH ₂ O	Y	Standard Flow [Q _s] m ³ /min
1	0.703	758.131	23.02	22.49	56.556	1.738	1.319	0.654
2	1.000	758.205	23.70	22.83	63.034	1.973	1.945	0.922
3	1.121	758.254	23.64	22.69	67.633	2.157	2.157	1.064
4	1.167	758.274	23.64	22.65	71.359	2.197	2.282	1.125
5	1.409	758.325	24.00	23.14	80.402	2.654	2.768	1.358

Slope (m): 2.05577
Intercept (b): -0.02807
Correlation coefficient (r): 0.99985
Uncertainty (k=2): 0.015 m³/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m ³ /min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Ap_meter mmHg	Ap_Orifice inH ₂ O	Y	Standard Flow [Q _s] m ³ /min
1	0.703	758.131	23.02	22.49	56.556	1.738	0.825	0.653
2	1.000	758.205	23.70	22.83	63.034	1.973	1.166	0.920
3	1.121	758.254	23.64	22.69	67.633	2.157	1.348	1.062
4	1.167	758.274	23.64	22.65	71.359	2.197	1.426	1.123
5	1.409	758.325	24.00	23.14	80.402	2.654	1.732	1.357

Slope (m): 1.28763
Intercept (b): -0.01756
Correlation coefficient (r): 0.99985
Uncertainty (k=2): 0.015 m³/min

End of Certificate of Calibration

Calibrated by:
☐ Mr. Sorawat Thachulad
☒ Miss Jiraporn Lertsomphol



Approved signatory:
Mr. Parinya Booncharoen
Calibration Department Manager



THIS CERTIFICATE REPORT MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION IS GRANTED IN WRITING FROM THE LABORATORY

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-9000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No. : 24P1252
Page : 1 of 2

Equipment : U Tube Manometer
Manufacturer: Dwyer
Model : 1221-36-W/M
Serial No.: -
ID No.: UAE.EFM.078/2566

Condition As-Received: Used Item
Received Date: 03 April 2024
Calibration Date: 11 April 2024

Reference: 2404-0118WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1011 mbar
Submitted by: United Analyst and Engineering Consultant Co., Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P04, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0176-23	12 Sep 2024

2.This result of calibration was made on requested at the point specified by customer.

3.Scale and conversion factor is 1 kPa = 4.0146293 inH₂O

4.This instrument was used clean air as pressure media.

5.This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6.This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

8.This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology (Thailand), NSC-ONSC Accredited No. Calibration 0144

Calibrated by : Suksan Khankaew
Issue Date : 17 April 2024

Approved Signatory :
[] Phalinee Prabpaipal
[] Sura Suwanmasri
[✓] Attapol Panurach

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Cert.No.: 24P1252
Page: 2 of 2

Result of calibration:- Without adjustment
Function:- Pressure Measurement
Increasing Pressure

Range: 0 inH₂O to 36 inH₂O
Scale Interval: 0.1 inH₂O (The Second Estimate)

Applied Pressure	High-port side	UUC Indication Low-port side	ΔP	Error
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.00
12.00	6.00	-6.00	12.00	0.00
14.00	7.00	-7.00	14.00	0.05
16.00	8.00	-8.00	16.00	0.05
18.00	9.00	-9.00	18.00	0.05
20.00	10.00	-10.00	20.10	0.10
22.00	11.00	-11.00	22.10	0.10
24.00	12.00	-12.00	24.10	0.10
26.00	13.00	-13.00	26.10	0.10
28.00	14.00	-14.00	28.10	0.10
30.00	15.00	-15.00	30.10	0.10
32.00	16.00	-16.00	32.10	0.10
34.00	17.00	-17.00	34.15	0.15
36.00	18.00	-18.00	36.00	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* UUC = Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No.: 25P112
Page: 1 of 2

Equipment: U-Tube Manometer

Manufacturer: Dwyer

Model: 121-36-W/M

Serial No.: -

ID No.: UAE_EFM,181/2561

Condition As-Received: Used Item

Received Date: 10 February 2025

Calibration Date: 19 February 2025

Reference: 2502-0063WSC

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1012 mbar

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.

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to in-house calibration procedure CP-P04, using "DKD-R 6-1 ; Calibration of Pressure
Gauges, Edition 03/2014 " as a guidelines.

Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0113-24	10 Jul 2025

2. This result of calibration was made on requested at the point specified by customer.

3. Scale and conversion factor is 1 kPa = 4.0145293 inH₂O

4. This instrument was used clean air as pressure media

5. This instrument was installed in vertical orientation and center of connector was used as the reference level.

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Noppapat Phongam
Issue Date: 21 February 2025

Approved Signatory: Attapol P.

[] Phalinee Pratsapal
[] Sura Suwannasri
[x] Attapol Panurach

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B 0250406



Cert.No.: 25P112
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Pressure Measurement
Increasing Pressure

Range: 0 inH₂O to 36 inH₂O

Scale Interval: 0.1 inH₂O (The Fifth Estimate)

UUC Indication				
Applied Pressure (inH ₂ O)	High-port side (inH ₂ O)	Low-port side (inH ₂ O)	ΔP (inH ₂ O)	Error (inH ₂ O)
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-0.98	1.98	-0.02
4.00	2.00	-1.96	3.96	-0.02
6.00	3.00	-3.02	5.02	0.02
8.00	4.00	-4.02	8.02	0.02
10.00	5.00	-5.04	10.04	0.04
12.00	6.00	-6.04	12.04	0.04
14.00	7.00	-7.06	14.06	0.06
16.00	8.00	-8.06	16.06	0.06
18.00	9.00	-9.06	18.06	0.06
20.00	10.00	-10.06	20.06	0.06
22.00	11.00	-11.08	22.08	0.08
24.00	12.00	-12.08	24.08	0.08
26.00	13.02	-13.10	26.12	0.12
28.00	14.02	-14.10	28.12	0.12
30.00	15.02	-15.10	30.12	0.12
32.00	16.02	-16.10	32.12	0.12
34.00	17.02	-17.08	34.10	0.10
35.50	17.86	-17.92	35.78	0.28

The uncertainty of measurement was ± 0.11 inH₂O

* UUC = Unit Under Calibration

* ΔP = High-port side - Low-port side

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

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Attapol P.

เอกสารไม่ควบคุม
a 1037943



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 24P1369
Page: 1 of 2

Equipment: Aneroid Barometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE_ANV,013/2547

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 22 April 2024

Reference: 2404-0243WSC

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1007 mbar

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments
Standard according to calibration procedure CP-P10, using "DKD-R 6-1 ; Calibration of Pressure Gauges " as
a guidelines.

Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0094-23	03 May 2024

2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.

3. This result of calibration was made on requested at the point specified by customer.

4. Scale and conversion factor is 1 kPa = 7.50062 mmHg

5. This result of calibration instrument was in absolute pressure.

6. This instrument was used clean air as pressure media.

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

8. This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Suksan Khankaew
Issue Date: 23 April 2024

Approved Signatory: Attapol P.

[] Phalinee Pratsapal
[] Sura Suwannasri
[x] Attapol Panurach

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Cert.No.: 24P1369
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Absolute Pressure Measurement
Increasing Pressure

Range: 720 mmHg to 780 mmHg

Scale Interval: 1 mmHg (The Fifth Estimate)

Applied Pressure (mmHg)	718.40	728.71	740.61	751.07	761.97	773.05	786.91
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	760.0	770.0	780.0
Error (mmHg)	1.60	0.29	-0.61	-1.07	-1.97	-3.05	-6.91

Decreasing Pressure							
Applied Pressure (mmHg)	786.91	772.99	761.71	750.69	740.13	729.35	718.44
UUC* Indication (mmHg)	780.0	770.0	760.0	750.0	740.0	730.0	720.0
Error (mmHg)	-6.91	-2.99	-1.71	-0.69	-0.13	0.65	1.56

The uncertainty of measurement was ± 0.24 mmHg

* UUC = Unit Under Calibration

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

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Certificate of Calibration

Certificate No. : 24P1367
Page : 1 of 2

Equipment : Aneroid Barometer

Manufacturer: Barigo

Model : -

Serial No.: -

ID No.: UAE.ANV.152/2550

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 22 April 2024

Reference: 2404-0243WSC

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Ambient Temperature: (23 ± 2) °C

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,

Relative Humidity: (50 ± 15) %

Phrakhanong, Bangkok 10260

Atmospheric Pressure: 1007 mbar

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0094-23	03 May 2024

2.This instrument was installed in vertical orientation and center of the dial was used as the reference level.

3.This result of calibration was made on requested at the point specified by customer.

4.This result of calibration instrument was in absolute pressure.

5.This instrument was used clean air as pressure media.

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

7.This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suksan Khankaew
Issue Date : 23 April 2024

Approved Signatory :
[] Phalinee Prabpaijai
[] Sura Suwannasri
[✓] Attapol Panurach

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Result of calibration:- Without adjustment

Range : 960 hPa to 1030 hPa

Function:- Absolute Pressure Measurement

Scale Interval : 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	957.13	968.77	980.13	990.56	1001.26	1011.35	1022.10	1032.61
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	2.87	1.23	-0.13	-0.56	-1.26	-1.35	-2.10	-2.61

Decreasing Pressure

Applied Pressure (hPa)	1032.61	1021.84	1010.88	1000.82	990.20	979.52	968.48	957.17
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-2.61	-1.84	-0.88	-0.82	-0.20	0.48	1.52	2.83

The uncertainty of measurement was ± 0.25 hPa

* UUC = Unit Under Calibration

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

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Certificate of Calibration

Certificate No. : 24P1857
Page : 1 of 2

Equipment : Aneroid Barometer

Manufacturer: Barigo

Model : -

Serial No.: -

ID No.: UAE.ANV.151/2550

Condition As-Received: Used Item

Received Date: 24 May 2024

Calibration Date: 04 June 2024

Reference: 2405-0919WSC

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Ambient Temperature: (23 ± 2) °C

81 Soi Udomsuk 41, Sukhumvit Road,

Relative Humidity: (50 ± 15) %

Bangkok, Phrakhanong, Bangkok 10260

Atmospheric Pressure: 1007 mbar

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure Gauges, Edition 03/2014 " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0094-24	03 May 2025

2.This instrument was installed in vertical orientation and center of the dial was used as the reference level.

3.This result of calibration was made on requested at the point specified by customer.

4.This result of calibration instrument was in absolute pressure.

5.This instrument was used clean air as pressure media.

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

7.This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Suksan Khankaew
Issue Date : 06 June 2024

Approved Signatory :
[] Phalinee Prabpaijai
[] Sura Suwannasri
[✓] Attapol Panurach

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0316957



Result of calibration:- Without adjustment

Range : 960 hPa to 1030 hPa

Function:- Absolute Pressure Measurement

Scale Interval : 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	960.27	971.66	982.37	994.32	1001.78	1010.97	1020.96	1030.52
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	-0.27	-1.66	-2.37	-4.32	-1.76	-0.97	-0.99	-0.52

Decreasing Pressure

Applied Pressure (hPa)	1030.52	1021.07	1011.30	1001.83	992.38	982.43	971.77	960.50
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-0.52	-1.07	-1.30	-1.83	-2.38	-2.43	-1.77	-0.50

The uncertainty of measurement was ± 0.30 hPa

* UUC = Unit Under Calibration

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

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Attapol P.
เอกสารไม่ควบคุม
a 1165501



Certificate of Calibration

Certificate No.: 25P1380
Page: 1 of 2

Equipment : Aneroid Barometer

Manufacturer: Barigo

Model : -

Serial No.: -

ID No.: UAE.ANV.125/2550

Condition As-Received: Used Item

Received Date: 04 April 2025

Calibration Date: 17 April 2025

Reference: 2504-0196WSC

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1005 mbar

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P10, using " DKD-R 6-1 ; Calibration of Pressure Gauges " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DP142	1422505046	MP-0133-24	15 May 2025

2.This instrument was installed in vertical orientation and center of the dial was used as the reference level.

3.This result of calibration was made on requested at the point specified by customer.

4.This result of calibration instrument was in absolute pressure.

5.This instrument was used clean air as pressure media.

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

7.This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Kanekpon Saivichai
Issue Date : 21 April 2025

Approved Signatory :

Attapol P.
[] Phalinee Pratsapaipal
[] Sura Suwannasari
[✓] Attapol Panurach

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Cert.No.: 25P1380
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Absolute Pressure Measurement

Range: 960 hPa to 1030 hPa
Scale Interval: 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	961.40	971.90	981.62	992.25	1001.35	1009.78	1019.56	1029.44
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	-1.40	-1.90	-1.62	-2.25	-1.35	0.24	0.44	0.56

Decreasing Pressure

Applied Pressure (hPa)	1029.44	1019.30	1009.48	1000.64	991.38	981.80	971.62	961.62
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	0.56	0.70	0.52	-0.54	-1.38	-1.80	-1.62	-1.62

The uncertainty of measurement was ± 0.25 hPa

* UUC = Unit Under Calibration

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

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Certificate of Calibration

Certificate No.: 24H757
Page: 1 of 2

Equipment : Dial Thermo-Hygrometer

Manufacturer: Barigo

Model : -

Serial No.: -

ID No.: UAE.ANV.132/2550

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 10 April 2024
to 18 April 2024

Reference: 2404-0247WSC

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	21656	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	A5A339	231238	16 Oct 2024

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

3.This Certification is traceable to the International System of Unit maintained through:-

-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200582-0

-Technology Promotion Association (Thailand-Japan), NSQ-ONSC Accredited No. Calibration 0008

Calibrated by : Chakrit Waewwanjua
Issue Date : 18 April 2024

Approved Signatory :

[✓] Chakrit Waewwanjua
[] Vipom Tantiyawutti
[] Unnopphol Harachai

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Cert.No.: 24H757
Page: 2 of 2

Result of Calibration:-

Function: Humidity Measurement.

Without Adjustment

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	41	0.9	1.6
25.0	60.0	61	1.0	1.7
25.0	80.0	76	-4.0	1.8

Result of Calibration:-

Function: Temperature Measurement.

Without Adjustment

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.007	20.5	0.493	0.72
25.032	25.5	0.468	0.72
29.997	30.0	0.003	0.72
35.010	35.0	-0.010	0.72
40.019	39.5	-0.519	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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Certificate of Calibration

Certificate No.: 24H753
Page: 1 of 2

Cert. No.: 24H753
Page: 2 of 2

Equipment : Dial Thermo-Hygrometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE.ANV.127/2550

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.

Condition As-Received: Used Item

Received Date: 05 April 2024

Calibration Date: 10 April 2024
to 18 April 2024

Reference: 2404-0247WSC

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udumak 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP402 according to comparison
with standard chilled mirror sensor for humidity measurement function and comparison with standard
temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	21656	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	A5A339	231238	16 Oct 2024

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

3.This Certification is traceable to the International System of Unit maintained through:-

-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 20058240

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by : Chakrit Waewwanjua
Issue Date : 18 April 2024

Approved Signatory :

[] Chakrit Waewwanjua
[✓] Vipom Tantiyawutti
[] Unnophol Harachai

เอกสารไม่ควบคุม



Result of Calibration:- Without Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	43	2.9	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	78	-2.0	1.8

Result of Calibration:- Without Adjustment
Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.014	20.0	-0.014	0.72
25.033	25.0	-0.033	0.72
30.010	30.0	-0.010	0.72
35.027	34.5	-0.527	0.72
40.013	39.5	-0.513	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied
by coverage factor k = 2.00, providing confidence level approximately 95%.

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เอกสารไม่ควบคุม



Certificate of Calibration

Certificate No.: 24H1486
Page: 1 of 2

Cert. No.: 24H1486
Page: 2 of 2

Equipment : Digital Thermo-Hygrometer
Manufacturer: Digicon
Model : TH-02A
Serial No.: 435031147
ID No.: UAE.EFM.005/2567

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.

Condition As-Received: New Item

Received Date: 10 July 2024

Calibration Date: 15 July 2024
to 17 July 2024

Reference: 2407-0393WSC

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udumak 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP-H03 according to comparison
with standard chilled mirror sensor for humidity measurement function and comparison with standard
temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Chilled Mirror Hygrometer Sensor	Dew Prime II	31863	21619	25 Sep 2024
2) Handheld Thermometer With Sensor	1523	5717096	231321	08 Nov 2024

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

3.This Certification is traceable to the International System of Unit maintained through:-

-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200582-0

-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by : Surasit Phansudrol
Issue Date : 17 July 2024

Approved Signatory :

[] Chakrit Waewwanjua
[✓] Vipom Tantiyawutti
[] Unnophol Harachai

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Result of Calibration:- Without Adjustment
Function: Humidity Measurement.

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	39	-1.1	1.4
25.0	50.1	48	-2.1	1.6
25.0	60.0	58	-2.0	1.6
25.0	70.2	69	-1.2	1.6

Result of Calibration:- Without Adjustment
Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.014	20.3	0.286	0.42
24.984	25.2	0.216	0.42
30.050	30.2	0.150	0.42
40.027	40.1	0.073	0.42

UUC* : Unit Under Calibration

The reported uncertainty of measurement was base on standard uncertainty multiplied
by coverage factor k = 2.00, providing confidence level approximately 95%.

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Certificate of Calibration

Certificate No.: 25H806
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer
Manufacturer: Barigo
Model: -
Serial No.: -
ID No.: UAE.ANV.001/2548

Condition As-Received: Used Item

Received Date: 04 April 2025

Calibration Date: 10 April 2025

Reference: 2504-0193WSC

Ambient Temperature: (25 ± 3) °C

Relative Humidity: (50 ± 20) %

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

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison
with standard chilled mirror sensor for humidity measurement function and comparison with standard
temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Chilled Mirror Hygrometer	Dew Master	44730	22688	10 Sep 2025
2) Handheld Thermometer With Sensor	1521	A5A339	241176	25 Oct 2025

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

3. This Certification is traceable to the International System of Unit maintained through:-

-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200562-0

-Technology Promotion Association (Thailand-Japan), NSC-ONS Accredited No. Calibration 0008

Calibrated by: Krasiporn Onrat

Issue Date: 18 April 2025

Approved Signatory:

[] Chakrit Waeuwwanjua
[] Ponthippa Taneyakul
[✓] Viporn Tantiyawutti

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Cert. No.: 25H806

Page: 2 of 2

Result of Calibration: Without Adjustment
Function: Humidity Measurement

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Correction (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	40.1	40	0.1	1.7
25.0	60.0	60	0.0	1.8
25.0	80.0	80	0.0	1.9

Result of Calibration: Without Adjustment
Function: Temperature Measurement

Standard Temperature (°C)	UUC* Reading (°C)	Correction (°C)	Uncertainty of Measurement (±°C)
20.012	20.5	-0.488	0.72
25.034	25.0	0.034	0.72
30.032	30.0	0.032	0.72
35.022	34.5	0.522	0.72
40.040	39.0	1.040	0.72

UUC* : Unit Under Calibration
The reported uncertainty of measurement was based on standard uncertainty multiplied
by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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เอกสารไม่ควบคุม



CALIBRATION LABORATORY CO., LTD.

210-11, 14, 58 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2572 www.cal-laboratory.com E-mail: sae@cal-laboratory.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12394/UM12394 [UAE.EFM.091/2560]
CLID. NO. : 251801348
JOB CONTROL NO. : 240608059619
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 08 June 2024

DATE OF ISSUED : 12 June 2024

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

Calibrated By: Suwit Phuanbusabong
Calibration Engineer



Approved By: Mongkol Yotsontorn
Authorized Signatory
12 June 2024

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the
International System of Units (SI)

Certificate No. Q24059619

F3-011-05/12-23

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เอกสารไม่ควบคุม



CALIBRATION LABORATORY CO., LTD.

210-11, 14, 58 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2572 www.cal-laboratory.com E-mail: sae@cal-laboratory.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12394/UM12394 [UAE.EFM.091/2560]
DATE OF CALIBRATION : 11 June 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C

Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Programmable Timer/Counter,

Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Digital Multimeter, Wavetek Model I281 S/N. 29320.

2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.

3. Accelerometer with Measuring Amplifier, Briel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd.

Certificate No. 05-0316/23, Due Date 21 July 2025.

2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd.

Certificate No. 07-0050/24, Due Date 13 May 2025.

3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand)

Certificate No. AV-0052/23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied
by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95%.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-402 M:2022)"

Certificate No. Q24059619

F3-011-05/12-23

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เอกสารไม่ควบคุม





CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.302	-0.002	1.9
0.4	50 Hz		0.400	0.402	-0.002	1.6
0.5	50 Hz		0.500	0.503	-0.003	1.6
0.6	50 Hz		0.600	0.604	-0.004	2.5
0.7	50 Hz		0.700	0.706	-0.006	2.5
0.3	100 Hz		0.300	0.303	-0.003	1.9
0.4	100 Hz	peak	0.400	0.405	-0.005	1.6
0.5	100 Hz		0.500	0.507	-0.007	1.6
0.6	100 Hz		0.600	0.608	-0.008	2.5
0.7	100 Hz		0.700	0.709	-0.009	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.023	-0.023	1.8
4	50 Hz		4.000	4.028	-0.028	1.8
5	50 Hz		5.000	5.036	-0.036	1.8
6	50 Hz		6.000	6.049	-0.049	1.8
7	50 Hz		7.000	7.059	-0.059	1.8
*3	100 Hz		3.000	3.037	-0.037	1.6
*4	100 Hz	peak	4.000	4.049	-0.049	1.6
*5	100 Hz		5.000	5.058	-0.058	1.6
*6	100 Hz		6.000	6.069	-0.069	1.5
*7	100 Hz		7.000	7.079	-0.079	1.5

Certificate No. Q24059619

F3-011-05/12-23

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เอกสารไม่ควบคุม



@calibration

CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
(mm)	(frequency)					
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.061	-0.001	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz		0.030	0.030	0.000	2.5
0.04	100 Hz	peak	0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.061	-0.001	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67

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

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

End of Certificate

Certificate No. Q24059619

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เอกสารไม่ควบคุม



@calibration



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12395/UM12395
CLID. NO. : 251801350
JOB CONTROL NO. : 240429042942
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 29 April 2024

DATE OF ISSUED : 03 May 2024

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

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer



Approved By :

Mongkol Yotsoontorn
Authorized Signatory
03 May 2024

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24042942

F3-011-05/12-23

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เอกสารไม่ควบคุม



@calibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12395/UM12395
DATE OF CALIBRATION : 30 April 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C

Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Universal Counter,

Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Digital Multimeter, Wavetek Model 1281 S/N. 29320.

2. Universal Counter, Hewlett Packard Model 5315A S/N. 2448A13042.

3. Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-031623, Due Date 21 July 2025.

2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-015925, Due Date 04 December 2024.

3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0052-23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 % . It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24042942

F3-011-05/12-23

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เอกสารไม่ควบคุม



@calibration



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	± (% of rdg.)
0.3	50 Hz	peak	0.300	0.302	-0.002	1.9
0.4	50 Hz		0.400	0.404	-0.004	1.6
0.5	50 Hz		0.500	0.505	-0.005	1.6
0.6	50 Hz		0.600	0.607	-0.007	2.5
0.7	50 Hz		0.700	0.708	-0.008	2.5
0.3	100 Hz	peak	0.300	0.301	-0.001	1.9
0.4	100 Hz		0.400	0.403	-0.003	1.6
0.5	100 Hz		0.500	0.506	-0.006	1.6
0.6	100 Hz		0.600	0.607	-0.007	2.5
0.7	100 Hz		0.700	0.709	-0.009	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	± (% of rdg.)
3	50 Hz	peak	3.000	3.013	-0.013	1.8
4	50 Hz		4.000	4.026	-0.026	1.8
5	50 Hz		5.000	5.033	-0.033	1.8
6	50 Hz		6.000	6.049	-0.049	1.8
7	50 Hz		7.000	7.061	-0.061	1.8
*3	100 Hz	peak	3.000	3.025	-0.025	1.6
*4	100 Hz		4.000	4.039	-0.039	1.6
*5	100 Hz		5.000	5.044	-0.044	1.6
*6	100 Hz		6.000	6.061	-0.061	1.5
*7	100 Hz		7.000	7.077	-0.077	1.5

Certificate No. Q24042942

F3-011-05/12-23

เอกสารไม่ควบคุม



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11355/UM11355 [UAE.EFM.002/2560]
CLID. NO. : 252000637
JOB CONTROL NO. : 240608059622
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 08 June 2024

DATE OF ISSUED : 12 June 2024

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

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer

Approved By :

Mongkol Yotsoontorn
Authorized Signatory
12 June 2024

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the
International System of Units (SI)

Certificate No. Q24059622

F3-011-05/12-23

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CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	± (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.061	-0.001	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.061	-0.001	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67

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

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

End of Certificate

Certificate No. Q24042942

F3-011-05/12-23

เอกสารไม่ควบคุม



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11355/UM11355 [UAE.EFM.002/2560]
DATE OF CALIBRATION : 11 June 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C

Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Programmable Timer/Counter,
Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavelec Model I281 S/N. 29320.
- Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0316/23, Due Date 21 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24, Due Date 13 May 2025.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0052-23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-402 M:2022)"

Certificate No. Q24059622

F3-011-05/12-23

เอกสารไม่ควบคุม





CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.298	+0.002	1.9
0.4	50 Hz		0.400	0.397	+0.003	1.6
0.5	50 Hz		0.500	0.496	+0.004	1.6
0.6	50 Hz		0.600	0.594	+0.006	2.5
0.7	50 Hz		0.700	0.693	+0.007	2.5
0.3	100 Hz	peak	0.300	0.301	-0.001	1.9
0.4	100 Hz		0.400	0.399	+0.001	1.6
0.5	100 Hz		0.500	0.497	+0.003	1.6
0.6	100 Hz		0.600	0.596	+0.004	2.5
0.7	100 Hz		0.700	0.696	+0.004	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.013	-0.013	1.8
4	50 Hz		4.000	4.028	-0.028	1.8
5	50 Hz		5.000	5.036	-0.036	1.8
6	50 Hz		6.000	6.039	-0.039	1.8
7	50 Hz		7.000	7.048	-0.048	1.8
*3	100 Hz	peak	3.000	3.014	-0.014	1.6
*4	100 Hz		4.000	4.021	-0.021	1.6
*5	100 Hz		5.000	5.029	-0.029	1.6
*6	100 Hz		6.000	6.032	-0.032	1.5
*7	100 Hz		7.000	7.038	-0.038	1.5

Certificate No. Q24059622

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gclidcalibration

CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
(mm)	(frequency)					
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.059	+0.001	1.8
0.07	50 Hz		0.070	0.069	+0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.059	+0.001	1.8
0.07	100 Hz		0.070	0.069	+0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67

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

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

End of Certificate

Certificate No. Q24059622

F3-011-05/12-23

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เอกสารไม่ควบคุม



gclidcalibration



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12888/UM12888
CLID. NO. : 251900037
JOB CONTROL NO. : 240429042943
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

81 SOI UDOMSIK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 29 April 2024

DATE OF ISSUED : 03 May 2024

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

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer



Approved By :

Mongkol Yotsontorn
Authorized Signatory
03 May 2024

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24042943

F3-011-05/12-23

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เอกสารไม่ควบคุม



gclidcalibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12888/UM12888
DATE OF CALIBRATION : 30 April 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C

Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Universal Counter,

Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Digital Multimeter, Wavetek Model 1281 S/N 29320.

2. Universal Counter, Hewlett Packard Model 5315A S/N 2448A13042.

3. Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N 397018, 2434988.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd.

Certificate No. 05-0316/23, Due Date 21 July 2025.

2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd.

Certificate No. 07-0159/23, Due Date 04 December 2024.

3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand)

Certificate No. AV-0092-23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied

by the coverage factor $k=2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4:02 M:2022)"

Certificate No. Q24042943

F3-011-05/12-23

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เอกสารไม่ควบคุม



gclidcalibration



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.390	0.391	-0.001	1.9
0.4	50 Hz		0.400	0.402	-0.002	1.6
0.5	50 Hz		0.500	0.503	-0.003	1.6
0.6	50 Hz		0.600	0.605	-0.005	2.5
0.7	50 Hz		0.700	0.707	-0.007	2.5
0.3	100 Hz	peak	0.300	0.301	-0.001	1.9
0.4	100 Hz		0.400	0.403	-0.003	1.6
0.5	100 Hz		0.500	0.504	-0.004	1.6
0.6	100 Hz		0.600	0.606	-0.006	2.5
0.7	100 Hz		0.700	0.707	-0.007	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	2.988	+0.012	1.8
4	50 Hz		4.000	3.967	+0.033	1.8
5	50 Hz		5.000	4.932	+0.068	1.8
6	50 Hz		6.000	5.919	+0.081	1.8
7	50 Hz		7.000	6.904	+0.096	1.8
*3	100 Hz	peak	3.000	2.987	+0.013	1.6
*4	100 Hz		4.000	3.976	+0.024	1.6
*5	100 Hz		5.000	4.965	+0.035	1.6
*6	100 Hz		6.000	5.956	+0.044	1.5
*7	100 Hz		7.000	6.944	+0.056	1.5

Certificate No. Q24042943

F3-011-05/12-23

เอกสารไม่ควบคุม



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12889/UM12889 [UAE.EFM.005/2561]
CLID. NO. : 251801805
JOB CONTROL NO. : 240608059620
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 08 June 2024

DATE OF ISSUED : 12 June 2024

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

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer

Approved By :

Mongkol Yotsontorn
Authorized Signatory
12 June 2024This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the
International System of Units (SI)

Certificate No. Q24059620

F3-011-05/12-23

เอกสารไม่ควบคุม



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12889/UM12889 [UAE.EFM.005/2561]
DATE OF CALIBRATION : 11 June 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C

Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Programmable Timer/Counter,

Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Digital Multimeter, Wavetek Model 1281 S/N. 29320.
2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd.
Certificate No. 05-0316/23, Due Date 21 July 2025.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd.
Certificate No. 07-0050/24, Due Date 13 May 2025.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand)
Certificate No. AV-0052-23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied
by the coverage factor $k=2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4:02 M:2022)"

Certificate No. Q24059620

F3-011-05/12-23

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CALIBRATION LABORATORY CO., LTD.

210-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail: sales@cal-laboratory.com



CALIBRATION LABORATORY CO., LTD.

210-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail: sales@cal-laboratory.com



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.297	+0.003	1.9
0.4	50 Hz		0.400	0.395	+0.005	1.6
0.5	50 Hz		0.500	0.493	+0.007	1.6
0.6	50 Hz		0.600	0.591	+0.009	2.5
0.7	50 Hz		0.700	0.690	+0.010	2.5
0.3	100 Hz	peak	0.300	0.301	-0.001	1.9
0.4	100 Hz		0.400	0.402	-0.002	1.6
0.5	100 Hz		0.500	0.503	-0.003	1.6
0.6	100 Hz		0.600	0.604	-0.004	2.5
0.7	100 Hz		0.700	0.704	-0.004	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.003	-0.003	1.8
4	50 Hz		4.000	4.008	-0.008	1.8
5	50 Hz		5.000	5.016	-0.016	1.8
6	50 Hz		6.000	6.029	-0.029	1.8
7	50 Hz		7.000	7.036	-0.036	1.8
*3	100 Hz	peak	3.000	3.009	-0.009	1.6
*4	100 Hz		4.000	4.018	-0.018	1.6
*5	100 Hz		5.000	5.023	-0.023	1.6
*6	100 Hz		6.000	6.031	-0.031	1.5
*7	100 Hz		7.000	7.049	-0.049	1.5

Certificate No. Q24059620

F3-011-05/12-23

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qccalibration

CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
(mm)	(frequency)					
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.060	0.000	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.061	-0.001	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67

* means Calibrations marked * Not ANAB Accredited * in this Certificate have been included for completeness.

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

End of Certificate

Certificate No. Q24059620

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qccalibration



CALIBRATION LABORATORY CO., LTD.

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail: sales@cal-laboratory.com



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210-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail: sales@cal-laboratory.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM13368/UM13368 [UAE.EFM.053/2561]
CLID. NO. : 251900391
JOB CONTROL NO. : 240515050332
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSIK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 15 May 2024

DATE OF ISSUED : 21 May 2024

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

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer

Approved By :

Mongkol Yotsoontorn
Authorized Signatory
21 May 2024



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24050332

F3-011-05/12-23

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เอกสารไม่ควบคุม



qccalibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM13368/UM13368 [UAE.EFM.053/2561]
DATE OF CALIBRATION : 17 May 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Universal Counter,

Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320.
- Universal Counter, Hewlett Packard Model 5315A S/N. 2448A13042.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0316/23, Due Date 21 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0159/23, Due Date 04 December 2024.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0052-23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement (EA-4/02 M:2022)"

Certificate No. Q24050332

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qccalibration



CALIBRATION LABORATORY Co.,LTD.

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



CALIBRATION LABORATORY Co.,LTD.

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



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.300	0.000	1.9
0.4	50 Hz		0.400	0.400	0.000	1.6
0.5	50 Hz		0.500	0.501	-0.001	1.6
0.6	50 Hz		0.600	0.601	-0.001	2.5
0.7	50 Hz		0.700	0.702	-0.002	2.5
0.3	100 Hz	peak	0.300	0.300	0.000	1.9
0.4	100 Hz		0.400	0.400	0.000	1.6
0.5	100 Hz		0.500	0.501	-0.001	1.6
0.6	100 Hz		0.600	0.601	-0.001	2.5
0.7	100 Hz		0.700	0.702	-0.002	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	2.998	+0.002	1.8
4	50 Hz		4.000	3.987	+0.013	1.8
5	50 Hz		5.000	4.982	+0.018	1.8
6	50 Hz		6.000	5.977	+0.023	1.8
7	50 Hz		7.000	6.965	+0.035	1.8
*3	100 Hz	peak	3.000	2.993	+0.007	1.6
*4	100 Hz		4.000	3.987	+0.013	1.6
*5	100 Hz		5.000	4.975	+0.025	1.6
*6	100 Hz		6.000	5.966	+0.034	1.5
*7	100 Hz		7.000	6.954	+0.046	1.5

Certificate No. Q24050332

F3-011-05/12-23



Certificate No. Q24050332

F3-011-05/12-23



CALIBRATION LABORATORY Co.,LTD.

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



CALIBRATION LABORATORY Co.,LTD.

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



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11056/UM11056
CLID. NO. : 252000389
JOB CONTROL NO. : 240406037351
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 06 April 2024

DATE OF ISSUED : 10 April 2024

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

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yotsontorn
Authorized Signatory
10 April 2024

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24037351

F3-011-05/12-23



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11056/UM11056
DATE OF CALIBRATION : 08 April 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Universal Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320
- Universal Counter, Hewlett Packard Model 5315A S/N. 2448A13042
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0316/23, Due Date 21 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0159/23, Due Date 04 December 2024.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0052-23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24037351

F3-011-05/12-23

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CALIBRATION LABORATORY Co.,LTD.

210-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax. 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CALIBRATION LABORATORY Co.,LTD.

210-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax. 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.302	-0.002	1.9
0.4	50 Hz		0.400	0.404	-0.004	1.6
0.5	50 Hz		0.500	0.505	-0.005	1.6
0.6	50 Hz		0.600	0.607	-0.007	2.5
0.7	50 Hz		0.700	0.708	-0.008	2.5
0.3	100 Hz	peak	0.300	0.302	-0.002	1.9
0.4	100 Hz		0.400	0.403	-0.003	1.6
0.5	100 Hz		0.500	0.505	-0.005	1.6
0.6	100 Hz		0.600	0.607	-0.007	2.5
0.7	100 Hz		0.700	0.708	-0.008	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.048	-0.048	1.8
4	50 Hz		4.000	4.058	-0.058	1.8
5	50 Hz		5.000	5.066	-0.066	1.8
6	50 Hz		6.000	6.079	-0.079	1.8
7	50 Hz		7.000	7.089	-0.089	1.8
*3	100 Hz	peak	3.000	3.033	-0.033	1.6
*4	100 Hz		4.000	4.045	-0.045	1.6
*5	100 Hz		5.000	5.056	-0.056	1.6
*6	100 Hz		6.000	6.067	-0.067	1.5
*7	100 Hz		7.000	7.079	-0.079	1.5

Certificate No. Q24037351
F3-011-05/12-23

เอกสารไม่ควบคุม



Certificate No. Q24037351
F3-011-05/12-23

เอกสารไม่ควบคุม



End of Certificate

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



CALIBRATION LABORATORY Co.,LTD.

210-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax. 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CALIBRATION LABORATORY Co.,LTD.

210-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax. 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11057/UM11057
CLID. NO. : 252000248
JOB CONTROL NO. : 240429042939
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 29 April 2024

DATE OF ISSUED : 03 May 2024

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

Calibrated By : Surwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yotsontorn
Authorized Signatory
03 May 2024

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24042939
F3-011-05/12-23

เอกสารไม่ควบคุม



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11057/UM11057
DATE OF CALIBRATION : 30 April 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C

Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Universal Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320.
- Universal Counter, Hewlett Packard Model 5315A S/N. 2448A13042.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0316/23, Due Date 21 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0159/23, Due Date 04 December 2024.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0052-23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4:02 M:2022)"

Certificate No. Q24042939
F3-011-05/12-23

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CALIBRATION LABORATORY Co.,LTD.

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



CALIBRATION LABORATORY Co.,LTD.

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



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	± (% of rdg.)
0.3	50 Hz	peak	0.300	0.304	-0.004	1.9
0.4	50 Hz		0.400	0.406	-0.006	1.6
0.5	50 Hz		0.500	0.507	-0.007	1.6
0.6	50 Hz		0.600	0.608	-0.008	2.5
0.7	50 Hz		0.700	0.709	-0.009	2.5
0.3	100 Hz	peak	0.300	0.305	-0.005	1.9
0.4	100 Hz		0.400	0.407	-0.007	1.6
0.5	100 Hz		0.500	0.508	-0.008	1.6
0.6	100 Hz		0.600	0.609	-0.009	2.5
0.7	100 Hz		0.700	0.711	-0.011	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	± (% of rdg.)
3	50 Hz	peak	3.000	3.036	-0.036	1.8
4	50 Hz		4.000	4.047	-0.047	1.8
5	50 Hz		5.000	5.059	-0.059	1.8
6	50 Hz		6.000	6.069	-0.069	1.8
7	50 Hz		7.000	7.083	-0.083	1.8
*3	100 Hz	peak	3.000	3.045	-0.045	1.6
*4	100 Hz		4.000	4.054	-0.054	1.6
*5	100 Hz		5.000	5.063	-0.063	1.6
*6	100 Hz		6.000	6.076	-0.076	1.5
*7	100 Hz		7.000	7.088	-0.088	1.5

Certificate No. Q24042939

F3-011-05/12-23

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CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	± (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.061	-0.001	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.061	-0.001	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67

* means Calibrations marked * Not ANAB Accredited * in this Certificate have been included for completeness.

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

End of Certificate

Certificate No. Q24042939

F3-011-05/12-23

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CALIBRATION LABORATORY Co.,LTD.

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



CALIBRATION LABORATORY Co.,LTD.

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



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11058/UM11058
CLID. NO. : 252000350
JOB CONTROL NO. : 240406037354
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 06 April 2024

DATE OF ISSUED : 10 April 2024

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

Calibrated By :

Surwit Phanbusabong
Calibration Engineer

Approved By :

Mongkol Yotsoontorn
Authorized Signatory
10 April 2024



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24037354

F3-011-05/12-23

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REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11058/UM11058
DATE OF CALIBRATION : 08 April 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Universal Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320
- Universal Counter, Hewlett Packard Model 3315A S/N. 2448A13042
- Accelerometer with Measuring Amplifier, Brüel & Kjaer Model 8305, 2525 S/N. 397018, 2434988

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0316/23, Due Date 21 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0159/23, Due Date 04 December 2024.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0052-23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02:2022)"

Certificate No. Q24037354

F3-011-05/12-23

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gcalibration



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.295	+0.005	1.9
0.4	50 Hz		0.400	0.394	+0.006	1.6
0.5	50 Hz		0.500	0.493	+0.007	1.6
0.6	50 Hz		0.600	0.593	+0.007	2.5
0.7	50 Hz		0.700	0.692	+0.008	2.5
0.3	100 Hz		0.300	0.296	+0.004	1.9
0.4	100 Hz	peak	0.400	0.395	+0.005	1.6
0.5	100 Hz		0.500	0.494	+0.006	1.6
0.6	100 Hz		0.600	0.594	+0.006	2.5
0.7	100 Hz		0.700	0.693	+0.007	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	2.989	+0.011	1.8
4	50 Hz		4.000	3.981	+0.019	1.8
5	50 Hz		5.000	4.962	+0.038	1.8
6	50 Hz		6.000	5.939	+0.061	1.8
7	50 Hz		7.000	6.924	+0.076	1.8
*3	100 Hz		3.000	2.983	+0.017	1.6
*4	100 Hz	peak	4.000	3.972	+0.028	1.6
*5	100 Hz		5.000	4.956	+0.044	1.6
*6	100 Hz		6.000	5.929	+0.071	1.5
*7	100 Hz		7.000	6.919	+0.081	1.5

Certificate No. Q24037354
F3-011-05/12-23

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clccalibration

Certificate No. Q24037354
F3-011-05/12-23

เอกสารไม่ควบคุม



clccalibration



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11059/UM11059
CLID. NO. : 252000388
JOB CONTROL NO. : 240406037352
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 06 April 2024

DATE OF ISSUED : 10 April 2024

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

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer

Approved By :

Mongkol Yotsontorn
Authorized Signatory
10 April 2024



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24037352
F3-011-05/12-23

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clccalibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11059/UM11059
DATE OF CALIBRATION : 08 April 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Universal Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320.
- Universal Counter, Hewlett Packard Model 5315A S/N. 2448A13042.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0316/23, Due Date 21 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0159/23, Due Date 04 December 2024.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0052-23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated in the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95%. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)".

Certificate No. Q24037352
F3-011-05/12-23

page 2 of 4

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clccalibration



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.303	-0.003	1.9
0.4	50 Hz		0.400	0.404	-0.004	1.6
0.5	50 Hz		0.500	0.505	-0.005	1.6
0.6	50 Hz		0.600	0.606	-0.006	2.5
0.7	50 Hz		0.700	0.708	-0.008	2.5
0.3	100 Hz		0.300	0.302	-0.002	1.9
0.4	100 Hz	peak	0.400	0.403	-0.003	1.6
0.5	100 Hz		0.500	0.504	-0.004	1.6
0.6	100 Hz		0.600	0.607	-0.007	2.5
0.7	100 Hz		0.700	0.709	-0.009	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.035	-0.035	1.8
4	50 Hz		4.000	4.041	-0.041	1.8
5	50 Hz		5.000	5.056	-0.056	1.8
6	50 Hz		6.000	6.068	-0.068	1.8
7	50 Hz		7.000	7.071	-0.071	1.8
*3	100 Hz		3.000	3.046	-0.046	1.6
*4	100 Hz	peak	4.000	4.051	-0.051	1.6
*5	100 Hz		5.000	5.063	-0.063	1.6
*6	100 Hz		6.000	6.072	-0.072	1.5
*7	100 Hz		7.000	7.088	-0.088	1.5

Certificate No. Q24037352
F3-011-05/12-23

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Certificate No. Q24037352
F3-011-05/12-23

เอกสารไม่ควบคุม



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14547/UM14547
CLID, NO. : 252000390
JOB CONTROL NO. : 240429042940
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 29 April 2024

DATE OF ISSUED : 03 May 2024

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

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yotsontorn
Authorized Signatory
03 May 2024

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24042940
F3-011-05/12-23

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REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14547/UM14547
DATE OF CALIBRATION : 30 April 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 3) °C Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Universal Counter, Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320.
- Universal Counter, Hewlett Packard Model 5315A S/N. 2448A13042.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0316/23, Due Date 21 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0159/23, Due Date 04 December 2024.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0052-23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4:02 M:2022)"

Certificate No. Q24042940
F3-011-05/12-23

เอกสารไม่ควบคุม





CALIBRATION LABORATORY Co.,LTD.

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



CALIBRATION LABORATORY Co.,LTD.

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



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.302	-0.002	1.9
0.4	50 Hz		0.400	0.404	-0.004	1.6
0.5	50 Hz		0.500	0.506	-0.006	1.6
0.6	50 Hz		0.600	0.607	-0.007	2.5
0.7	50 Hz		0.700	0.708	-0.008	2.5
0.3	100 Hz	peak	0.300	0.304	-0.004	1.9
0.4	100 Hz		0.400	0.405	-0.005	1.6
0.5	100 Hz		0.500	0.507	-0.007	1.6
0.6	100 Hz		0.600	0.609	-0.009	2.5
0.7	100 Hz		0.700	0.711	-0.011	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.023	-0.023	1.8
4	50 Hz		4.000	4.039	-0.039	1.8
5	50 Hz		5.000	5.049	-0.049	1.8
6	50 Hz		6.000	6.057	-0.057	1.8
7	50 Hz		7.000	7.071	-0.071	1.8
*3	100 Hz	peak	3.000	3.032	-0.032	1.6
*4	100 Hz		4.000	4.044	-0.044	1.6
*5	100 Hz		5.000	5.058	-0.058	1.6
*6	100 Hz		6.000	6.066	-0.066	1.5
*7	100 Hz		7.000	7.081	-0.081	1.5

Certificate No. Q24042940

F3-011-05/12-23

เอกสารไม่ควบคุม



Certificate No. Q24042940

F3-011-05/12-23

เอกสารไม่ควบคุม



CALIBRATION LABORATORY Co.,LTD.

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



CALIBRATION LABORATORY Co.,LTD.

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



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14105/UM14105
CLID. NO. : 252001626
JOB CONTROL NO. : 240429042941
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 29 April 2024

DATE OF ISSUED : 03 May 2024

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

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer



Approved By :

Mongkol Yotsoontorn
Authorized Signatory
03 May 2024

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24042941

F3-011-05/12-23

เอกสารไม่ควบคุม



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14105/UM14105
DATE OF CALIBRATION : 30 April 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C

Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Universal Counter.

Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Digital Multimeter, Wavetek Model 1281 S/N. 29320
- Universal Counter, Hewlett Packard Model 5315A S/N. 2448A13042
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 05-0316/23, Due Date 21 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0159/23, Due Date 04 December 2024.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0052-23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24042941

F3-011-05/12-23

เอกสารไม่ควบคุม





CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.301	-0.001	1.9
0.4	50 Hz		0.400	0.403	-0.003	1.6
0.5	50 Hz		0.500	0.504	-0.004	1.6
0.6	50 Hz		0.600	0.605	-0.005	2.5
0.7	50 Hz		0.700	0.707	-0.007	2.5
0.3	100 Hz	peak	0.300	0.301	-0.001	1.9
0.4	100 Hz		0.400	0.402	-0.002	1.6
0.5	100 Hz		0.500	0.504	-0.004	1.6
0.6	100 Hz		0.600	0.606	-0.006	2.5
0.7	100 Hz		0.700	0.708	-0.008	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.018	-0.018	1.8
4	50 Hz		4.000	4.023	-0.023	1.8
5	50 Hz		5.000	5.039	-0.039	1.8
6	50 Hz		6.000	6.046	-0.046	1.8
7	50 Hz		7.000	7.057	-0.057	1.8
*3	100 Hz	peak	3.000	3.024	-0.024	1.6
*4	100 Hz		4.000	4.034	-0.034	1.6
*5	100 Hz		5.000	5.042	-0.042	1.6
*6	100 Hz		6.000	6.055	-0.055	1.5
*7	100 Hz		7.000	7.061	-0.061	1.5

Certificate No. Q24042941

F3-011-05/12-23

เอกสารไม่ควบคุม



gdc calibration

CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
(mm)	(frequency)					
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.060	0.000	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.060	0.000	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67

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

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

End of Certificate

Certificate No. Q24042941

F3-011-05/12-23

เอกสารไม่ควบคุม



gdc calibration



Supplement to Calibration Certificate No. Q24135551

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12865/UM12865 [UAE.EFM.001/2561]
CLID. NO. : 251891712
JOB CONTROL NO. : 241219135551
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 19 December 2024

DATE OF ISSUED : 29 January 2025

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

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yotsontorn
Authorized Signatory
29 January 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).

Certificate No. Q24135551A1

F3-012-05/12-23

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เอกสารไม่ควบคุม



gdc calibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM12865/UM12865 [UAE.EFM.001/2561]
DATE OF CALIBRATION : 20 December 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.
- Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
- Digital Multimeter, Keysight Technologies Model 3458A S/N. MY5932733.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-24, Due Date 19 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24, Due Date 13 May 2025.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24135551A1

F3-012-05/12-23

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เอกสารไม่ควบคุม



gdc calibration

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	± (% of rdg.)
0.3	50 Hz	peak	0.300	0.302	-0.002	1.9
0.4	50 Hz		0.400	0.404	-0.004	1.6
0.5	50 Hz		0.500	0.507	-0.007	1.6
0.6	50 Hz		0.600	0.609	-0.009	2.5
0.7	50 Hz		0.700	0.711	-0.011	2.5
0.3	100 Hz	peak	0.300	0.302	-0.002	1.9
0.4	100 Hz		0.400	0.403	-0.003	1.6
0.5	100 Hz		0.500	0.506	-0.006	1.6
0.6	100 Hz		0.600	0.608	-0.008	2.5
0.7	100 Hz		0.700	0.713	-0.013	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	± (% of rdg.)
3	50 Hz	peak	3.000	3.024	-0.024	1.8
4	50 Hz		4.000	4.037	-0.037	1.8
5	50 Hz		5.000	5.049	-0.049	1.8
6	50 Hz		6.000	6.058	-0.058	1.8
7	50 Hz		7.000	7.081	-0.081	1.8
*3	100 Hz	peak	3.000	3.026	-0.026	1.6
*4	100 Hz		4.000	4.039	-0.039	1.6
*5	100 Hz		5.000	5.051	-0.051	1.6
*6	100 Hz		6.000	6.078	-0.078	1.5
*7	100 Hz		7.000	7.098	-0.098	1.5

Certificate No. Q24135551

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เอกสารไม่ควบคุม



qccalibration

CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	± (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.061	-0.001	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.061	-0.001	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67.

* means Calibrations marked * Not ANAB Accredited in this Certificate have been included for completeness.

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

End of Certificate

Certificate No. Q24135551

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เอกสารไม่ควบคุม



qccalibration

Supplement to Calibration Certificate No. Q24135552

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM13539/UM13539 [UAE.EFM.114/2561]
CLID. NO. : 251900390
JOB CONTROL NO. : 241219135552
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSIK 41, SUKHUMVIT ROAD,
BANGCHIAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 19 December 2024

DATE OF ISSUED : 29 January 2025

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

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yotsontorn
Authorized Signatory
29 January 2025



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24135552A1

F3-012-05/12-23

page 1 of 4

เอกสารไม่ควบคุม



qccalibration

Supplement to Calibration Certificate No. Q24135552

REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2501/721A2901
SERIAL NO. : UM13539/UM13539 [UAE.EFM.114/2561]
DATE OF CALIBRATION : 20 December 2024

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$ Relative Humidity : $(55 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Vibration Calibrator

which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.
2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-24, Due Date 19 July 2025.

2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24, Due Date 13 May 2025.

3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied

by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)".

Certificate No. Q24135552A1

F3-012-05/12-23

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เอกสารไม่ควบคุม



qccalibration



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	± (% of rdg.)
0.3	50 Hz	peak	0.300	0.305	-0.005	1.9
0.4	50 Hz		0.400	0.407	-0.007	1.6
0.5	50 Hz		0.500	0.509	-0.009	1.6
0.6	50 Hz		0.600	0.611	-0.011	2.5
0.7	50 Hz		0.700	0.713	-0.013	2.5
0.3	100 Hz	peak	0.300	0.304	-0.004	1.9
0.4	100 Hz		0.400	0.406	-0.006	1.6
0.5	100 Hz		0.500	0.508	-0.008	1.6
0.6	100 Hz		0.600	0.611	-0.011	2.5
0.7	100 Hz		0.700	0.713	-0.013	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	± (% of rdg.)
3	50 Hz	peak	3.000	3.042	-0.042	1.8
4	50 Hz		4.000	4.054	-0.054	1.8
5	50 Hz		5.000	5.066	-0.066	1.8
6	50 Hz		6.000	6.079	-0.079	1.8
7	50 Hz		7.000	7.095	-0.095	1.8
*3	100 Hz	peak	3.000	3.039	-0.039	1.6
*4	100 Hz		4.000	4.049	-0.049	1.6
*5	100 Hz		5.000	5.071	-0.071	1.6
*6	100 Hz		6.000	6.088	-0.088	1.5
*7	100 Hz		7.000	7.104	-0.104	1.5

Certificate No. Q24135552

F3-011-05/12-23

เอกสารไม่ควบคุม



Certificate No. Q24135552

F3-011-05/12-23

เอกสารไม่ควบคุม



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11058/UM11058 [UAE.EFM.025/2562]
CLID. NO. : 252000350
JOB CONTROL NO. : 250331038315
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 31 March 2025

DATE OF ISSUED : 05 April 2025

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

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer



Approved By :

Mongkol Yotsoontorn
Authorized Signatory
05 April 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the
International System of Units (SI)

Certificate No. Q25038315

F3-011-05/12-23

เอกสารไม่ควบคุม



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11058/UM11058 [UAE.EFM.025/2562]
DATE OF CALIBRATION : 01 April 2025

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C

Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Accelerometer with Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
2. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.
3. Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2625 S/N. 397018, 2434988.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24, Due Date 13 May 2025.
2. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0056-24, Due Date 14 December 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4-02 M:2022)"

Certificate No. Q25038315

F3-011-05/12-23

เอกสารไม่ควบคุม





CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.295	+0.005	1.9
0.4	50 Hz		0.400	0.394	+0.006	1.3
0.5	50 Hz		0.500	0.492	+0.008	1.3
0.6	50 Hz		0.600	0.591	+0.009	2.5
0.7	50 Hz		0.700	0.689	+0.011	2.5
0.3	100 Hz	peak	0.300	0.294	+0.006	1.9
0.4	100 Hz		0.400	0.393	+0.007	1.3
0.5	100 Hz		0.500	0.493	+0.007	1.3
0.6	100 Hz		0.600	0.592	+0.008	2.5
0.7	100 Hz		0.700	0.690	+0.010	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	2.983	+0.017	1.8
4	50 Hz		4.000	3.976	+0.024	1.8
5	50 Hz		5.000	4.955	+0.045	1.8
6	50 Hz		6.000	5.929	+0.071	1.8
7	50 Hz		7.000	6.918	+0.082	1.8
3	100 Hz	peak	3.000	2.978	+0.022	2.7
4	100 Hz		4.000	3.962	+0.038	1.3
5	100 Hz		5.000	4.951	+0.049	1.3
6	100 Hz		6.000	5.922	+0.078	1.0
7	100 Hz		7.000	6.911	+0.089	1.0

Certificate No. Q25038315

F3-011-05/12-23

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idcalibration

CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
(mm)	(frequency)					
0.03	50 Hz	peak	0.030	0.030	0.000	2.1
0.04	50 Hz		0.040	0.040	0.000	1.7
0.05	50 Hz		0.050	0.050	0.000	1.4
0.06	50 Hz		0.060	0.060	0.000	1.3
0.07	50 Hz		0.070	0.069	+0.001	1.1
0.03	100 Hz	peak	0.030	0.030	0.000	2.1
0.04	100 Hz		0.040	0.040	0.000	1.7
0.05	100 Hz		0.050	0.050	0.000	1.4
0.06	100 Hz		0.060	0.059	+0.001	1.3
0.07	100 Hz		0.070	0.069	+0.001	1.1

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 1,2 of 68

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

End of Certificate

Certificate No. Q25038315

F3-011-05/12-23

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CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11060/UM11060 [UAE.EFM.027/2562]
CLID. NO. : 252000349
JOB CONTROL NO. : 250331038316
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 31 March 2025

DATE OF ISSUED : 05 April 2025

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

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer



Approved By :

Mongkol Yotsontorn
Authorized Signatory
05 April 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the
International System of Units (SI)

Certificate No. Q25038316

F3-011-05/12-23

เอกสารไม่ควบคุม



idcalibration



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM11060/UM11060 [UAE.EFM.027/2562]
DATE OF CALIBRATION : 01 April 2025

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Accelerometer with Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
2. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.
3. Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2625 S/N. 397018, 2434988.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24 , Due Date 13 May 2025 .
2. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0056-24, Due Date 14 December 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 % .
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4-02 M:2022)"

Certificate No. Q25038316

F3-011-05/12-23

เอกสารไม่ควบคุม



idcalibration



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	± (% of rdg.)
0.3	50 Hz	peak	0.300	0.299	+0.001	1.9
0.4	50 Hz		0.400	0.398	+0.002	1.3
0.5	50 Hz		0.500	0.498	+0.002	1.3
0.6	50 Hz		0.600	0.597	+0.003	2.5
0.7	50 Hz		0.700	0.695	+0.005	2.5
0.3	100 Hz	peak	0.300	0.298	+0.002	1.9
0.4	100 Hz		0.400	0.398	+0.002	1.3
0.5	100 Hz		0.500	0.497	+0.003	1.3
0.6	100 Hz		0.600	0.597	+0.003	2.5
0.7	100 Hz		0.700	0.696	+0.004	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	± (% of rdg.)
3	50 Hz	peak	3.000	2.996	+0.004	1.8
4	50 Hz		4.000	3.992	+0.008	1.8
5	50 Hz		5.000	4.985	+0.015	1.8
6	50 Hz		6.000	5.982	+0.018	1.8
7	50 Hz		7.000	6.976	+0.024	1.8
3	100 Hz	peak	3.000	2.994	+0.006	2.7
4	100 Hz		4.000	3.992	+0.008	1.3
5	100 Hz		5.000	4.985	+0.015	1.3
6	100 Hz		6.000	5.980	+0.020	1.0
7	100 Hz		7.000	6.972	+0.028	1.0

Certificate No. Q25038316

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clccalibration

CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	± (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.1
0.04	50 Hz		0.040	0.040	0.000	1.7
0.05	50 Hz		0.050	0.050	0.000	1.4
0.06	50 Hz		0.060	0.060	0.000	1.3
0.07	50 Hz		0.070	0.070	0.000	1.1
0.03	100 Hz	peak	0.030	0.030	0.000	2.1
0.04	100 Hz		0.040	0.040	0.000	1.7
0.05	100 Hz		0.050	0.050	0.000	1.4
0.06	100 Hz		0.060	0.060	0.000	1.3
0.07	100 Hz		0.070	0.069	+0.001	1.1

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 1,2 of 68

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

End of Certificate

Certificate No. Q25038316

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clccalibration



Supplement to Calibration Certificate No. Q24127999

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14546/UM14546 [UAE.EFM.030/2562]
CLID. NO. : 252000247
JOB CONTROL NO. : 241203127999
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSIK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 03 December 2024

DATE OF ISSUED : 29 January 2025

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

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yotsontorn
Authorized Signatory
29 January 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24127999A1

F3-012-05/12-23

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clccalibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14546/UM14546 [UAE.EFM.030/2562]
DATE OF CALIBRATION : 04 December 2024

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$ Relative Humidity : $(55 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Vibration Calibrator

which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.
- Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
- Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-24, Due Date 19 July 2025.

2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24 , Due Date 13 May 2025 .

3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025 .

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 % . It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24127999A1

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clccalibration



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.305	-0.005	1.9
0.4	50 Hz		0.400	0.407	-0.007	1.6
0.5	50 Hz		0.500	0.508	-0.008	1.6
0.6	50 Hz		0.600	0.609	-0.009	2.5
0.7	50 Hz		0.700	0.710	-0.010	2.5
0.3	100 Hz		0.300	0.304	-0.004	1.9
0.4	100 Hz		0.400	0.406	-0.006	1.6
0.5	100 Hz	peak	0.500	0.508	-0.008	1.6
0.6	100 Hz		0.600	0.608	-0.008	2.5
0.7	100 Hz		0.700	0.709	-0.009	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.047	-0.047	1.8
4	50 Hz		4.000	4.054	-0.054	1.8
5	50 Hz		5.000	5.066	-0.066	1.8
6	50 Hz		6.000	6.079	-0.079	1.8
7	50 Hz		7.000	7.097	-0.097	1.8
*3	100 Hz		3.000	3.045	-0.045	1.6
*4	100 Hz		4.000	4.066	-0.066	1.6
*5	100 Hz	peak	5.000	5.075	-0.075	1.6
*6	100 Hz		6.000	6.088	-0.088	1.5
*7	100 Hz		7.000	7.101	-0.101	1.5

Certificate No. Q24127999

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idccalibration

CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
(mm)	(frequency)					
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.061	-0.001	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz		0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz	peak	0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.060	0.000	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1, 2 of 67

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

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

End of Certificate

Certificate No. Q24127999

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idccalibration



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14465/UM14465 [UAE.EFM.094/2562]
CLID. NO. : 252000712
JOB CONTROL NO. : 250331038318
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 31 March 2025

DATE OF ISSUED : 05 April 2025

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

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer



Approved By :

Mongkol Yotsontorn
Authorized Signatory
05 April 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the
International System of Units (SI)

Certificate No. Q25038318

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idccalibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14465/UM14465 [UAE.EFM.094/2562]
DATE OF CALIBRATION : 01 April 2025

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C

Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Accelerometer with Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
2. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.
3. Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2625 S/N. 397018, 2434988.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24, Due Date 13 May 2025.
2. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0056-24, Due Date 14 December 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4-02 M:2022)"

Certificate No. Q25038318

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idccalibration



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.304	-0.004	1.9
0.4	50 Hz		0.400	0.406	-0.006	1.3
0.5	50 Hz		0.500	0.507	-0.007	1.3
0.6	50 Hz		0.600	0.608	-0.008	2.5
0.7	50 Hz		0.700	0.709	-0.009	2.5
0.3	100 Hz	peak	0.300	0.305	-0.005	1.9
0.4	100 Hz		0.400	0.406	-0.006	1.3
0.5	100 Hz		0.500	0.507	-0.007	1.3
0.6	100 Hz		0.600	0.608	-0.008	2.5
0.7	100 Hz		0.700	0.710	-0.010	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.044	-0.044	1.8
4	50 Hz		4.000	4.052	-0.052	1.8
5	50 Hz		5.000	5.066	-0.066	1.8
6	50 Hz		6.000	6.073	-0.073	1.8
7	50 Hz		7.000	7.084	-0.084	1.8
3	100 Hz	peak	3.000	3.059	-0.059	2.7
4	100 Hz		4.000	4.067	-0.067	1.3
5	100 Hz		5.000	5.074	-0.074	1.3
6	100 Hz		6.000	6.081	-0.081	1.0
7	100 Hz		7.000	7.096	-0.096	1.0

Certificate No. Q25038318

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gclidcalibration

CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
(mm)	(frequency)					
0.03	50 Hz	peak	0.030	0.030	0.000	2.1
0.04	50 Hz		0.040	0.040	0.000	1.7
0.05	50 Hz		0.050	0.050	0.000	1.4
0.06	50 Hz		0.060	0.060	0.000	1.3
0.07	50 Hz		0.070	0.071	-0.001	1.1
0.03	100 Hz	peak	0.030	0.030	0.000	2.1
0.04	100 Hz		0.040	0.040	0.000	1.7
0.05	100 Hz		0.050	0.050	0.000	1.4
0.06	100 Hz		0.060	0.061	-0.001	1.3
0.07	100 Hz		0.070	0.071	-0.001	1.1

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 1,2 of 68

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

End of Certificate

Certificate No. Q25038318

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gclidcalibration



Supplement to Calibration Certificate No. Q24128001

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14466/UM14466 [UAE.EFM.095/2562]
CLID. NO. : 252000053
JOB CONTROL NO. : 241203128001
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 03 December 2024

DATE OF ISSUED : 29 January 2025

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

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
29 January 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24128001A1

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gclidcalibration

REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14466/UM14466 [UAE.EFM.095/2562]
DATE OF CALIBRATION : 04 December 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Vibration Calibrator, The Modal Shop Model 91100 S/N. 11424.
- Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
- Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-24, Due Date 19 July 2025.
- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-6050/24, Due Date 13 May 2025.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4:02 M:2022)"

Certificate No. Q24128001A1

F3-012-05/12-23

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เอกสารไม่ควบคุม



gclidcalibration



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.300	0.000	1.9
0.4	50 Hz		0.400	0.401	-0.001	1.6
0.5	50 Hz		0.500	0.503	-0.003	1.6
0.6	50 Hz		0.600	0.605	-0.005	2.5
0.7	50 Hz		0.700	0.707	-0.007	2.5
0.3	100 Hz	peak	0.300	0.301	-0.001	1.9
0.4	100 Hz		0.400	0.403	-0.003	1.6
0.5	100 Hz		0.500	0.505	-0.005	1.6
0.6	100 Hz		0.600	0.605	-0.005	2.5
0.7	100 Hz		0.700	0.707	-0.007	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.011	-0.011	1.8
4	50 Hz		4.000	4.030	-0.030	1.8
5	50 Hz		5.000	5.044	-0.044	1.8
6	50 Hz		6.000	6.056	-0.056	1.8
7	50 Hz		7.000	7.079	-0.079	1.8
*3	100 Hz	peak	3.000	3.022	-0.022	1.6
*4	100 Hz		4.000	4.037	-0.037	1.6
*5	100 Hz		5.000	5.041	-0.041	1.6
*6	100 Hz		6.000	6.052	-0.052	1.5
*7	100 Hz		7.000	7.077	-0.077	1.5

Certificate No. Q24128001

F3-011-05/12-23

เอกสารไม่ควบคุม



qccalibration

CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
(mm)	(frequency)					
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.061	-0.001	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.061	-0.001	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note: The Scope of Accredited - ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67

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

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

End of Certificate

Certificate No. Q24128001

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เอกสารไม่ควบคุม



qccalibration



Supplement to Calibration Certificate No. Q24128000

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14467/UM14467 [UAE.EFM.096/2562]
CLID. NO. : 252000050
JOB CONTROL NO. : 241203128000
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSIK 41, SUKHUMVIT ROAD,
BANGCHIAK, THIRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 03 December 2024

DATE OF ISSUED : 29 January 2025

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

Calibrated By : Suwit Phuanbusabong
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
29 January 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q24128000A1

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เอกสารไม่ควบคุม



qccalibration



Supplement to Calibration Certificate No. Q24128000

REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14467/UM14467 [UAE.EFM.096/2562]
DATE OF CALIBRATION : 04 December 2024

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Vibration Calibrator which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Vibration Calibrator, The Modal Shop Model 9110D S/N. 11424.
2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0030-24, Due Date 19 July 2025.

2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24, Due Date 13 May 2025.

3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24128000A1

F3-012-05/12-23

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เอกสารไม่ควบคุม



qccalibration



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading (g)	DUC Reading (g)	Correction (g)	Uncertainty ± (% of rdg.)
(g)	(frequency)					
0.3	50 Hz	peak	0.300	0.302	-0.002	1.9
0.4	50 Hz		0.400	0.402	-0.002	1.6
0.5	50 Hz		0.500	0.503	-0.003	1.6
0.6	50 Hz		0.600	0.603	-0.003	2.5
0.7	50 Hz		0.700	0.705	-0.005	2.5
0.3	100 Hz	peak	0.300	0.301	-0.001	1.9
0.4	100 Hz		0.400	0.402	-0.002	1.6
0.5	100 Hz		0.500	0.502	-0.002	1.6
0.6	100 Hz		0.600	0.603	-0.003	2.5
0.7	100 Hz		0.700	0.705	-0.005	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading (mm/s)	DUC Reading (mm/s)	Correction (mm/s)	Uncertainty ± (% of rdg.)
(mm/s)	(frequency)					
3	50 Hz	peak	3.000	3.015	-0.015	1.8
4	50 Hz		4.000	4.024	-0.024	1.8
5	50 Hz		5.000	5.034	-0.034	1.8
6	50 Hz		6.000	6.044	-0.044	1.8
7	50 Hz		7.000	7.058	-0.058	1.8
*3	100 Hz	peak	3.000	3.033	-0.033	1.6
*4	100 Hz		4.000	4.047	-0.047	1.6
*5	100 Hz		5.000	5.055	-0.055	1.6
*6	100 Hz		6.000	6.062	-0.062	1.5
*7	100 Hz		7.000	7.080	-0.080	1.5

Certificate No. Q24128000

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CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading (mm)	DUC Reading (mm)	Correction (mm)	Uncertainty ± (% of rdg.)
(mm)	(frequency)					
0.03	50 Hz	peak	0.030	0.030	0.000	2.5
0.04	50 Hz		0.040	0.040	0.000	2.1
0.05	50 Hz		0.050	0.050	0.000	1.9
0.06	50 Hz		0.060	0.060	0.000	1.8
0.07	50 Hz		0.070	0.071	-0.001	1.8
0.03	100 Hz	peak	0.030	0.030	0.000	2.5
0.04	100 Hz		0.040	0.040	0.000	2.1
0.05	100 Hz		0.050	0.050	0.000	1.9
0.06	100 Hz		0.060	0.060	0.000	1.8
0.07	100 Hz		0.070	0.071	-0.001	1.8

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 1,2 of 67

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

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

End of Certificate

Certificate No. Q24128000

F3-011-05/12-23



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14469/UM14469 [UAE.EFM.098/2562]
CLID. NO. : 252000347
JOB CONTROL NO. : 250331038317
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHANONG, BANGKOK 10260

DATE OF RECEIVED : 31 March 2025

DATE OF ISSUED : 05 April 2025

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

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer



Approved By :

Mongkol Yotsontorn
Authorized Signatory
05 April 2025

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the
International System of Units (SI)

Certificate No. Q25038317

F3-011-05/12-23



REPORT OF CALIBRATION

FOR

NOMENCLATURE : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : 721A2601/721A3301
SERIAL NO. : UM14469/UM14469 [UAE.EFM.098/2562]
DATE OF CALIBRATION : 01 April 2025

ENVIRONMENT CONDITIONS :

Temperature : (23 ± 2) °C Relative Humidity : (55 ± 15) %RH

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-08 based on ISO 16063-21 as calibration guideline.

The calibration was performed by using Digital Multimeter, Programmable Timer/Counter, Accelerometer with Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

- Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
- Digital Multimeter, Keysight Technologies Model 3458A S/N. MY59352733.
- Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2625 S/N. 397018, 2434988.

TRACEABILITY :

- The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd. Certificate No. 07-0050/24, Due Date 13 May 2025.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0060-24, Due Date 26 June 2025.
- The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0056-24, Due Date 14 December 2025.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4-02 M:2022)"

Certificate No. Q25038317

F3-011-05/12-23





CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. ACCELERATION RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(g)	(frequency)		(g)	(g)	(g)	± (% of rdg.)
0.3	50 Hz	peak	0.300	0.300	0.000	1.9
0.4	50 Hz		0.400	0.400	0.000	1.3
0.5	50 Hz		0.500	0.502	-0.002	1.3
0.6	50 Hz		0.600	0.602	-0.002	2.5
0.7	50 Hz		0.700	0.703	-0.003	2.5
0.3	100 Hz	peak	0.300	0.302	-0.002	1.9
0.4	100 Hz		0.400	0.403	-0.003	1.3
0.5	100 Hz		0.500	0.504	-0.004	1.3
0.6	100 Hz		0.600	0.605	-0.005	2.5
0.7	100 Hz		0.700	0.706	-0.006	2.5

2. VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	± (% of rdg.)
3	50 Hz	peak	3.000	3.002	-0.002	1.8
4	50 Hz		4.000	4.008	-0.008	1.8
5	50 Hz		5.000	5.013	-0.013	1.8
6	50 Hz		6.000	6.015	-0.015	1.8
7	50 Hz		7.000	7.021	-0.021	1.8
3	100 Hz	peak	3.000	3.004	-0.004	2.7
4	100 Hz		4.000	4.011	-0.011	1.3
5	100 Hz		5.000	5.017	-0.017	1.3
6	100 Hz		6.000	6.021	-0.021	1.0
7	100 Hz		7.000	7.024	-0.024	1.0

Certificate No. Q25038317

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CALIBRATION DATA

3. DISPLACEMENT RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm)	(frequency)		(mm)	(mm)	(mm)	± (% of rdg.)
0.03	50 Hz	peak	0.030	0.030	0.000	2.1
0.04	50 Hz		0.040	0.040	0.000	1.7
0.05	50 Hz		0.050	0.050	0.000	1.4
0.06	50 Hz		0.060	0.060	0.000	1.3
0.07	50 Hz		0.070	0.071	-0.001	1.1
0.03	100 Hz	peak	0.030	0.030	0.000	2.1
0.04	100 Hz		0.040	0.040	0.000	1.7
0.05	100 Hz		0.050	0.050	0.000	1.4
0.06	100 Hz		0.060	0.060	0.000	1.3
0.07	100 Hz		0.070	0.071	-0.001	1.1

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 015 Page 1,2 of 68

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

End of Certificate

Certificate No. Q25038317

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AC-2807

Page 1 of 3

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING
CONSULTANT CO.,LTD.
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Prakanong, Bangkok 10260Certificate No : 24-ACT-086
Request No : Req-2024-1364

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 2
Manufacturer : LARSON DAVIS Range : 94 , 114 dB / 1000 Hz
Model : CAL150 Instrument Status : Used
Serial Number : 6171
ID : UAE-EFM.117/2562

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ± 0.9 hPa)
Received Date : 20 June 2024
Calibration Date : 25 June 2024
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators.

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	12 June 2025
THD Multimeter	2015	1047765	NIMT	16 January 2025

Traceability : This certificate provides traceability of measurement 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. Noppadon Luangart
Service Calibration EngineerApproved By :
Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 25 June 2024

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ACCREDITED
CALIBRATION LABORATORY
AC-2807

Page 2 of 3

Certificate No : 24-ACT-086

Request No : Req-2024-1364

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 2 (± dB)	Result
	Measured	Deviated value	Measured	Deviated value			
94 dB / 1000 Hz	93.99	-0.01	-	-	0.13	0.40	Pass
114 dB / 1000 Hz	114.02	0.02	-	-	0.14	0.40	Pass

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 2 (± %)	Result
	Measured (Hz)	Deviated	Measured (Hz)	Deviated			
94 dB / 1000 Hz	1000.00	0.00	-	-	0.01	1.7	Pass
114 dB / 1000 Hz	1000.00	0.00	-	-	0.01	1.7	Pass

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty (± %)	Acceptance limit Class 2 (± %)	Result
	Measured (%)	Measured (%)			
94 dB / 1000 Hz	0.05	-	0.40	3.0	Pass
114 dB / 1000 Hz	0.30	-	0.40	3.0	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
Sound pressure level	0.35 dB
Frequency	0.20%
Total distortion+noise	1.00%

- Acceptance limit was IEC60942:2017 Class 1

- The calibration results exclude the calibration pressure correction

- The calibration results exclude the microphone volume correction

เอกสารไม่ควบคุม

Certificate No : 24-ACT-086
Request No : Req-2024-1364

Decision Rule for Statements of Conformity

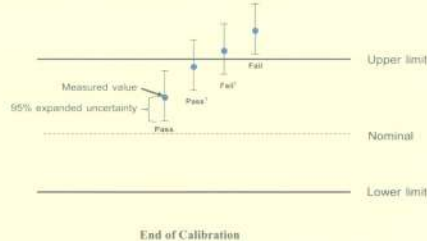
The standard decision rule employed for the statements of conformity to such calibration result will be applied using ILAC-G8:09/2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ - The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Calibration

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory. **เอกสารไม่ควมคุม**
FM-708-ACT-02 Rev.03 Issue date 5/6/24

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING
CONSULTANT CO.,LTD.
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong,
Bangkok 10260

Certificate No : 24-ACT-077
Request No : Req-2024-1138

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 1
Manufacturer : SVANTEK Range : 94 , 114 dB / 1000Hz
Model : SV 35A Instrument Status : Used
Serial Number : 73246
ID : UAE EFM.104/2561

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 23 May 2024
Calibration Date : 30 May 2024
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators


Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	31 May 2024
THD Multimeter	2015	1047765	NIMT	16 January 2025

Traceability : This certificate provides traceability of measurement 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. Noppadon Luangart
Service Calibration Engineer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 30 May 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory. **เอกสารไม่ควมคุม**
FM-708-ACT-02 Rev.03 Issue date6/8/23

Certificate No : 24-ACT-077
Request No : Req-2024-1138

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)
	Measured	Deviated value	Measured	Deviated value		
94 dB / 1000 Hz	93.83	-0.17	-	-	0.13	0.25
114 dB / 1000 Hz	113.80	-0.20	-	-	0.13	0.25

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (Hz)	Deviated value	Measured (Hz)	Deviated value		
94 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70
114 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (%)	Measured (%)	Measured (%)	Measured (%)		
94 dB / 1000 Hz	0.09	-	-	-	0.40	2.5
114 dB / 1000 Hz	0.28	-	-	-	0.40	2.5

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 exclude the calibrator pressure correction

- The calibration results exclude the microphone volume correction

End of Calibration

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory. **เอกสารไม่ควมคุม**
FM-708-ACT-02 Rev.03 Issue date6/8/23

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING
CONSULTANT CO.,LTD.
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Prakanong, Bangkok 10260

Certificate No : 24-ACT-120
Request No : Req-2024-1896

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 2
Manufacturer : LARSON DAVIS Range : 94 , 114 dB / 1000 Hz
Model : CAL150 Instrument Status : Used
Serial Number : 6307
ID : UAE EFM.049/2563

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 26 August 2024
Calibration Date : 10 September 2024
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators


Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	12 June 2025
THD Multimeter	2015	1047765	NIMT	16 January 2025

Traceability : This certificate provides traceability of measurement 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. Noppadon Luangart
Service Calibration Engineer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor

Issue Date : 10 September 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory. **เอกสารไม่ควมคุม**
FM-708-ACT-02 Rev.03 Issue date 5/6/24

Certificate No : 24-ACT-120

Request No : Req-2024-1896

Calibration Results : Without Adjustment

Sound pressure level

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (\pm dB)	Acceptance limit Class 2 (\pm dB)	Result
	Measured	Deviated value	Measured	Deviated value			
94 dB / 1000 Hz	93.96	-0.04	-	-	0.13	0.40	Pass
114 dB / 1000 Hz	114.04	0.04	-	-	0.13	0.40	Pass

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (\pm %)	Acceptance limit Class 2 (\pm %)	Result
	Measured (Hz)	Deviated	Measured (Hz)	Deviated			
94 dB / 1000 Hz	999.14	0.09	-	-	0.01	1.7	Pass
114 dB / 1000 Hz	999.11	0.09	-	-	0.01	1.7	Pass

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (\pm %)	Acceptance limit Class 2 (\pm %)	Result
	Measured (%)	Measured (%)	Measured (%)	Measured (%)			
94 dB / 1000 Hz	0.12	-	-	-	0.40	3.0	Pass
114 dB / 1000 Hz	0.23	-	-	-	0.40	3.0	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
Sound pressure level	0.35 dB
Frequency	0.20%
Total distortion+noise	1.00%

- Acceptance limit was IEC60942:2017 Class 1

- The calibration results exclude the calibration pressure correction

- The calibration results exclude the microphone volume correction

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

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FM-708-ACT-02 Rev-03 Issue date 5/6/24

Certificate No : 24-ACT-120

Request No : Req-2024-1896

Decision Rule for Statements of Conformity

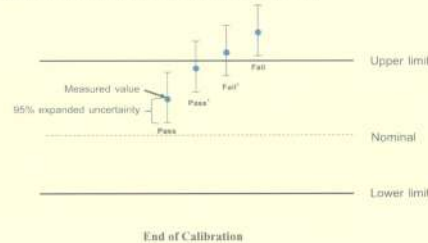
The standard decision rule employed for the statements of conformity in each calibration result will be applied using ILAC-G8:09/2018, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements:

Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass^h - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail^h - The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Calibration

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

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FM-708-ACT-02 Rev-03 Issue date 5/6/24

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok

10260

Unit Under Calibration Details

Measurement item : Sound Level Meter

Manufacturer : Larson Davis

Model : LxT2

Serial Number : 6005299

ID : UAE-EFM-114-2562

Resolution : 0.1 dB

Microphone Class : 2

Microphone Model : 375A04

Microphone S/N : 323471

Preamplifier Model : P90MLST2C

Preamplifier S/N : 071493

Instrument Status : Used

Calibration Environment and Details

Temperature : 23.3°C \pm 2.1°C

Humidity : 50 %RH \pm 20 %RH

Barometric Pressure : 1013 hPa \pm 10 hPa

Received Date : 2 July 2024

Calibrated Date : 11 July 2024

Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-1 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests

Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	20 August 2024	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	Svanick	Svan401	131	8 October 2024	WK Electric

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. Noppadon Luangrit
Service Engineer Supervisor

Approved By :
Mr. Patch Mahavorn
Calibration Engineer Supervisor
Issue Date : 11 July 2024

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FM-708-SLM-01 Rev-04 Issue date 5/6/24

Certificate No : 24-SLM-240

Request No : Req-2024-1459

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)			
FAST / A / 37-139 Calibrator Setting	Level	(dB)	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
1000 Hz 114 dB	113.76	113.3	1.54	113.8	+0.04	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, S/N. 58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(\pm dB)
UUC Weighting	(dB)	(\pm dB)
A	27.1	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(\pm dB)
UUC Weighting	(dB)	(\pm dB)
A	26.6	0.10
C	26.2	0.10
Z	30.6	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
	A (dB)	C (dB)	Z (dB)			
FAST / 37-139	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
STD Setting	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
125 Hz	0.0	0.2	0.1	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	0.2	0.3	0.4	0.60	3.0	Pass
8000 Hz	-0.5	-0.4	-0.2	0.70	5.0	Pass

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FM-708-SLM-01 Rev-04 Issue date 5/6/24

Certificate No : 24-SLM-240
Request No : Req/2024-1459

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / 37-139	Weighting Response curve					
STD Setting	A (dB)	C (dB)	Z (dB)	0.20		
63 Hz	-0.2	0.0	0.0		2.0	Pass
125 Hz	-0.1	0.0	0.0		1.5	Pass
250 Hz	-0.1	0.0	0.0		1.5	Pass
500 Hz	-0.1	0.0	0.0		1.5	Pass
1000 Hz	0.0	0.0	0.0		1.0	Pass
2000 Hz	0.0	0.0	0.0		2.0	Pass
4000 Hz	0.0	0.0	0.0		3.0	Pass
8000 Hz	0.0	0.0	0.0		5.0	Pass
16000 Hz	-0.1	-0.1	-0.1	+5, -INF	Pass	

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
		REF	UUC	ERR		
FAST / 37-139						
UUC Weighting	(dB)	(dB)	(dB)			
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0		0.20	Pass
Z	114.00	114.0	0.0		0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
		REF	UUC	ERR		
37-139 / A						
UUC Time Response	(dB)	(dB)	(dB)			
Fast	114.00	114.0	0.0	0.20	0.10	Pass
Slow	114.00	114.0	0.0		0.10	Pass
Leq	114.00	114.0	0.0		0.10	Pass

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FM-708-SLM-01 Rev.04 Issue date 3/6/24

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Certificate No : 24-SLM-240
Request No : Req/2024-1459

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
FAST / A / 37-139	UUC			
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

UUC Setting	Anticipated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
		REF	UUC	ERR		
FAST / A / 37-139	(dB)	(dB)	(dB)	(dB)		
STD dB	(dB)					
139.00	139	139.0	0.0	0.30	1.1	Pass
134.00	134	134.0	0.0		1.1	Pass
129.00	129	129.0	0.0		1.1	Pass
124.00	124	124.0	0.0		1.1	Pass
119.00	119	119.0	0.0		1.1	Pass
114.00	114	114.0	0.0		1.1	Pass
109.00	109	109.0	0.0		1.1	Pass
104.00	104	104.0	0.0		1.1	Pass
99.00	99	99.0	0.0		1.1	Pass
94.00	94	94.0	0.0		1.1	Pass
89.00	89	89.0	0.0		1.1	Pass
84.00	84	84.0	0.0		1.1	Pass
79.00	79	79.0	0.0		1.1	Pass
74.00	74	74.0	0.0		1.1	Pass
69.00	69	69.0	0.0		1.1	Pass
64.00	64	64.0	0.0		1.1	Pass
59.00	59	59.0	0.0		1.1	Pass
54.00	54	54.0	0.0		1.1	Pass
49.00	49	49.0	0.0		1.1	Pass
44.00	44	44.0	0.0		1.1	Pass
39.00	39	38.2	0.2		1.1	Pass
34.00	34	34.5	0.5		1.1	Pass
29.00	29	37.4	0.4		1.1	Pass
24.00	24	26.5	0.5		1.1	Pass

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FM-708-SLM-01 Rev.04 Issue date 3/6/24

เอกสารไม่ควบคุม

Certificate No : 24-SLM-240
Request No : Req/2024-1459

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
		REF	UUC	ERR		
FAST / A						
UUC Range	(dB)	(dB)	(dB)			
37-139	41.90	42.1	0.2	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
			Ref	UUC	ERR		
A / 37-139							
UUC Time Response	(ms)	(dB)	(dB)	(dB)			
Fast	200	135.0	134.9	-0.1	0.20	1.0	Pass
	2	118.0	117.9	-0.1		+1.0, -2.5	Pass
	0.25	109.0	108.8	-0.2		+1.5, -5.0	Pass
Slow	200	128.6	128.5	-0.1		1.0	Pass
	2	109.0	108.9	-0.1		+1.0, -5.0	Pass
	200	129.0	129.0	0.0		1.0	Pass
SEL	2	109.0	109.1	+0.1		+1.0, -2.5	Pass
	0.25	100.0	100.0	0.0		+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
		REF	UUC	ERR		
FAST / C / 95-142						
STD Setting	(dB)	(dB)	(dB)			
Complete cycle	137.4	136.6	-0.80	0.20	3.0	Pass
Positive half cycle	136.4	136.2	-0.20		2.0	Pass
Negative half cycle	136.4	136.2	-0.20		2.0	Pass

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FM-708-SLM-01 Rev.04 Issue date 3/6/24

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Certificate No : 24-SLM-240
Request No : Req/2024-1459

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
FAST / A / 37-139	UUC			
STD Setting	(dB)			
Positive one-half cycle	140.6			
Negative one-half cycle	140.7			
Deviation	-0.1	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
FAST / A / 37-139	UUC			
STD Setting	(dB)			
Initial	138.0			
Final	138.0			
Deviation	0.0			
		0.10	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 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1 kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

> Acceptance limit and Maximum-permitted Uncertainty was IEC 61072-1:2013

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FM-708-SLM-01 Rev.04 Issue date 3/6/24

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Certificate No : 24-SLM-240
Request No : Req-2024-1459

Decision Rule for Statements of Conformity

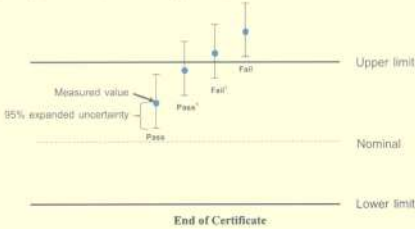
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements:

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were 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

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FSI-709-SLM-01 Rev.04 Issue date 5/6/24

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 24-SLM-229
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok Request No : Req-2024-1448
10260

Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 2
Manufacturer : Larson Davis Microphone Model : J75B02
Model : LA72 Microphone S/N : 11792
Serial Number : 0005372 Pre-amplifier Model : PRMLXT2B
ID : UAE-EFM.037.2563 Pre-amplifier S/N : 056132
Resolution : 0.1 dB Instrument Status : Used

Calibration Environment and Details


Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013.5 hPa ± 10 hPa
Received Date : 1 July 2024
Calibrated Date : 9 July 2024
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic


Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	20 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	SvanteK	Scan401	131	8 October 2024	WK Electric

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. Noppon Luangrit
Service Calibration Engineer

Approved By : 
Mr. Paet Mahayorn
Calibration Engineer Supervisor
Issue Date : 9 July 2024

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

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FSI-709-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-229
Request No : Req-2024-1448

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust			After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
	Level (dB)	UUC (dB)	ERR (dB)	ERR (dB)	UUC (dB)	ERR (dB)			
Calibrator Setting									
1000 Hz 114 dB	113.76	114.7	0.94		113.8	+0.04	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN: 38079

2. Self-generated noise, Microphone installed

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 37-139		
UUC Weighting		
A	32.6	0.10

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

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 37-139		
UUC Weighting		
A	31.8	0.10
C	31.7	0.10
Z	35.6	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
	A	C	Z			
FAST / 37-139						
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
125 Hz	0.1	0.2	0.1	0.69	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.69	1.0	Pass
4000 Hz	0.3	0.3	0.4	0.69	3.0	Pass
8000 Hz	0.3	0.3	0.5	0.70	5.0	Pass

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

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FSI-709-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-229
Request No : Req-2024-1448

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 (± dB)	Acceptance Limit (± dB)	Result
FAST / 37-139	A (dB)	C (dB)	Z (dB)			
STD Setting						
63 Hz	-0.1	0.0	0.0	0.20	2.0	Pass
125 Hz	-0.1	0.0	0.0		1.5	Pass
250 Hz	-0.1	0.0	0.0		1.5	Pass
500 Hz	0.0	0.0	0.0		1.5	Pass
1000 Hz	0.0	0.0	0.0		1.0	Pass
2000 Hz	0.0	0.1	0.0		2.0	Pass
4000 Hz	0.0	0.0	0.0		3.0	Pass
8000 Hz	0.0	0.0	0.1		5.0	Pass
16000 Hz	0.0	0.0	0.0		+5, -INF	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / 37-139	REF	UUC (dB)	ERR (dB)			
UUC Weighting						
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0		0.20	Pass
Z	114.00	114.0	0.0		0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
37-139 / A	REF	UUC (dB)	ERR (dB)			
UUC Time Response						
Fast	114.00	114.0	0.0	0.20	0.10	Pass1
Slow	114.00	114.0	0.0		0.10	Pass1
Leq	114.00	114.0	0.0		0.10	Pass1

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

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FSI-709-SLM-01 Rev.04 Issue date 5/6/24

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	UUC	(± dB)	(± dB)	
STD Setting	(dB)			
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.30	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	REF	UUC	ERR	Limit	Result
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)
139.00	139	139.0	0.0	1.1	Pass
134.00	134	134.0	0.0	1.1	Pass
129.00	129	129.0	0.0	1.1	Pass
124.00	124	124.0	0.0	1.1	Pass
119.00	119	119.0	0.0	1.1	Pass
114.00	114	114.0	0.0	1.1	Pass
109.00	109	109.0	0.0	1.1	Pass
104.00	104	104.0	0.0	1.1	Pass
99.00	99	99.0	0.0	1.1	Pass
94.00	94	93.6	-0.4	1.1	Pass
89.00	89	88.6	-0.4	1.1	Pass
84.00	84	83.6	-0.4	1.1	Pass
79.00	79	78.6	-0.4	1.1	Pass
74.00	74	73.6	-0.4	1.1	Pass
69.00	69	68.6	-0.4	1.1	Pass
64.00	64	63.6	-0.4	1.1	Pass
59.00	59	58.6	-0.4	1.1	Pass
54.00	54	53.6	-0.4	1.1	Pass
49.00	49	48.7	-0.3	1.1	Pass
44.00	44	43.9	-0.1	1.1	Pass
39.00	39	39.5	0.5	1.1	Pass
34.00	34	34.9	0.9	1.1	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of **เอกสารไม่ควบคุม**
FSI-708-SLM-01 Rev.04 Issue date: 5/6/24

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	UUC	(± dB)	(± dB)	
STD Setting	(dB)			
Positive one-half cycle	140.7			
Negative one-half cycle	140.7			
Deviated	0.0	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	UUC	(± dB)	(± dB)	
STD Setting	(dB)			
Initial	138.0			
Final	138.0			
Deviated	0.0	0.10	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 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

→ Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-1:2013

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9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance	Result
FAST / A	REF	UUC	ERR	Limit	Result
UUC Range	(dB)	(dB)	(dB)	(± dB)	(± dB)
37-139	39.10	39.6	0.5	0.30	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance	Result
A / 37-139	Toneburst	Ref	UUC	ERR	Limit	Result
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	200	135.0	135.0	0.0	1.0	Pass
	2	118.0	117.9	-0.1	+1.0, -2.5	Pass
	0.25	109.0	108.8	-0.2	+1.5, -5.0	Pass
Slow	200	128.6	128.5	-0.1	1.0	Pass
	2	109.0	108.9	-0.1	+1.0, -5.0	Pass
	200	129.0	129.0	0.0	1.0	Pass
SEL	2	109.0	109.1	+0.1	+1.0, -2.5	Pass
	0.25	100.0	100.0	0.0	+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance	Result
FAST / C / 95-142	REF	UUC	ERR	Limit	Result
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
Complete cycle	137.4	136.8	-0.60	3.0	Pass
Positive half cycle	136.4	136.2	-0.20	2.0	Pass
Negative half cycle	136.4	136.2	-0.20	2.0	Pass

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Decision Rule for Statements of Conformity

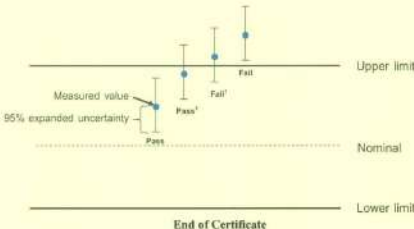
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



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FSI-708-SLM-01 Rev.04 Issue date: 5/6/24

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.LTD.

Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10269

Certificate No : 24-SLM-234

Request No : Req-2024-1453

Unit Under Calibration Details

Measurement Item : Sound Level Meter

Manufacturer : Larson Davis

Model : LXT2

Serial Number : 0005286

ID : UAE-FEM.102-2562

Resolution : 0.1 dB

Microphone Class : 2

Microphone Model : 375BQ2

Microphone S/N : 011740

Preamplifier Model : PRMLX12B

Preamplifier S/N : 056087

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 : 1 July 2024

Calibrated Date : 10 July 2024

Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests


Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	20 August 2024	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	SvanteK	Svans011	131	8 October 2024	WK Electric


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. Nopadon Luangrit

Service Calibration Engineer

Approved By : 

Mr. Pacht Mahavorn

Calibration Engineer Supervisor




Issue Date : 10 July 2024

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134-708-SLM-01 Rev.04 Issue date 5/6/24

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/19 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KALO,
AMPHOE BANG PHU SAHUT PRAKAN PROVINCE 10540 THAILAN
TEL : 0669-2116-5800-1 FAX: 0669-2116-7140



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Certificate No : 24-SLM-234

Request No : Req-2024-1453

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust	After Adjust	UNCERTAINTY	Acceptance	Result		
FAST / A / 37-129	Level	UUC	ERR	UUC	Limit			
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)			
1000 Hz 114 dB	113.76	114.4	0.64	113.8	+0.04	0.20	0.30	Pass

Note :

Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN: 58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-129	(dB)	(± dB)
UUC Weighting	(dB)	(± dB)
A	31.3	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-129	(dB)	(± dB)
UUC Weighting	(dB)	(± dB)
A	31.1	0.10
C	30.6	0.10
Z	34.9	0.10

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




UUC Setting	Deviation from various Frequency	UNCERTAINTY	Acceptance	Result		
FAST / 37-129	Weighting Response curve		Limit			
STD Setting	(dB)	(dB)	(dB)	(± dB)		
125 Hz	0.0	0.1	0.1	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	1.2	1.2	1.2	0.60	3.0	Pass
8000 Hz	2.7	2.8	2.9	0.70	5.0	Pass

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134-708-SLM-01 Rev.04 Issue date 5/6/24

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Certificate No : 24-SLM-234

Request No : Req-2024-1453

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

UUC Setting	Deviation from various Frequency	UNCERTAINTY	Acceptance	Result
FAST / 37-129	Weighting Response curve		Limit	
STD Setting	A (dB) C (dB) Z (dB)	(± dB)	(± dB)	
63 Hz	-0.1 0.0 0.0	0.20	2.0	Pass
125 Hz	-0.1 0.0 0.0	0.20	1.5	Pass
250 Hz	-0.1 0.0 0.0	0.20	1.5	Pass
500 Hz	0.0 0.0 0.0	0.20	1.5	Pass
1000 Hz	0.0 0.0 0.0	0.20	1.0	Pass
2000 Hz	0.0 0.0 0.0	0.20	2.0	Pass
4000 Hz	0.0 0.0 0.0	0.20	3.0	Pass
8000 Hz	0.0 0.0 0.0	0.20	5.0	Pass
16000 Hz	0.0 -0.1 -0.1	0.20	+3, -INF	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance	Result
FAST / 37-129	REF	UUC	ERR	Limit	
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	(± dB)
A	114.00	114.0	0.0	0.20	Pass
C	114.00	114.0	0.0	0.20	Pass
Z	114.00	114.0	0.0	0.20	Pass




UUC Setting	STD	Measured	UNCERTAINTY	Acceptance	Result
37-129 / A	REF	UUC	ERR	Limit	
UUC Time Response	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	114.00	114.0	0.0	0.10	Pass
Slow	114.00	114.0	0.0	0.10	Pass
1eq	114.00	114.0	0.0	0.10	Pass

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134-708-SLM-01 Rev.04 Issue date 5/6/24

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Certificate No : 24-SLM-234

Request No : Req-2024-1453

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 37-129	UUC	(± dB)	Limit	
STD Setting	(dB)	(± dB)	(± dB)	
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.30	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance	Result
FAST / A / 37-129	REF	UUC	ERR	Limit	
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)
136.00	139	136.0	0.0	1.1	Pass
134.00	134	134.0	0.0	1.1	Pass
129.00	129	129.0	0.0	1.1	Pass
124.00	124	124.0	0.0	1.1	Pass
119.00	119	119.0	0.0	1.1	Pass
114.00	114	114.0	0.0	1.1	Pass
109.00	109	109.0	0.0	1.1	Pass
104.00	104	104.0	0.0	1.1	Pass
99.00	99	99.0	0.0	1.1	Pass
94.00	94	94.0	0.0	1.1	Pass
89.00	89	89.0	0.0	1.1	Pass
84.00	84	84.0	0.0	1.1	Pass
79.00	79	79.0	0.0	1.1	Pass
74.00	74	74.0	0.0	1.1	Pass
69.00	69	69.0	0.0	1.1	Pass
64.00	64	64.0	0.0	1.1	Pass
59.00	59	59.0	0.0	1.1	Pass
54.00	54	54.0	0.0	1.1	Pass
49.00	49	49.1	0.1	1.1	Pass
44.00	44	44.2	0.2	1.1	Pass
43.00	43	43.3	0.3	1.1	Pass
42.00	42	42.3	0.3	1.1	Pass
41.00	41	41.4	0.4	1.1	Pass

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134-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-234
Request No : Req-2024-1453

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		UUC	ERR			
FAST / A	REF	(dB)	(dB)	0.30	1.1	Pass
UUC Range	(dB)	(dB)	(dB)			
	114	114.0	0.0			
37-139					1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
			UUC	ERR			
A / 37-139	Toneburst	Ref	(dB)	(dB)	0.20	1.0	Pass
UUC Time Response	(ms)	(dB)	(dB)	(dB)			
	200	135.0	134.9	-0.1			
	2	118.0	117.6	-0.4			
Fast	0.25	109.0	108.6	-0.4		+1.0, -2.5	Pass
	200	128.6	128.5	-0.1		+1.5, -5.0	Pass
	2	109.0	108.9	-0.1		1.0	Pass
Slow	2	109.0	108.9	-0.1		+1.0, -5.0	Pass
	200	129.0	129.0	0.0		1.0	Pass
	2	109.0	109.0	0.0		+1.0, -2.5	Pass
SEL	0.25	100.0	99.8	-0.2		+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance	Result
FAST / C / 95-142	REF	UUC	ERR	(± dB)	Limit	
STD Setting	(dB)	(dB)	(dB)		(± dB)	
Complete cycle	137.4	136.8	-0.60		0.20	3.0
Positive half cycle	136.4	136.2	-0.20			2.0
Negative half cycle	136.4	136.2	-0.20	2.0		

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FSM-708-SLM-01 Rev.04 Issue date: 5/6/24

Certificate No : 24-SLM-234
Request No : Req-2024-1453

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 37-139	UUC	(± dB)	(± dB)	
STD Setting	(dB)			
Positive one-half cycle	145.5			
Negative one-half cycle	145.4			
Deviated	0.1	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 37-139	UUC	(± dB)	(± dB)	
STD Setting	(dB)			
Initial	138.0			
Final	138.0			
Deviated	0.0	0.10	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 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1 kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

= Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-3:2013

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FSM-708-SLM-01 Rev.04 Issue date: 5/6/24

Certificate No : 24-SLM-234
Request No : Req-2024-1453

Decision Rule for Statements of Conformity

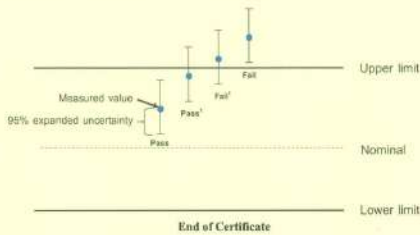
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



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FSM-708-SLM-01 Rev.04 Issue date: 5/6/24

Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok 10260
Certificate No : 24-SLM-238
Request No : Req-2024-1457

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : Larson Davis
Model : LxT2
Serial Number : 0005290
ID : UAE-EFM109/2562
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 375A04
Microphone S/N : 351837
Preamplifier Model : PRM1 sT20
Preamplifier S/N : 056077
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 : 2 July 2024
Calibrated Date : 11 July 2024
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	20 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA009234	26 July 2024	TSI
Audio Generator	Svanteck	Svany401	131	8 October 2024	WK Electric

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 Luangart
Service Calibration Engineer

Approved By : 
Mr. Pichit Mathavorn
Calibration Engineer Supervisor
Issue Date : 11 July 2024

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FSM-708-SLM-01 Rev.04 Issue date: 5/6/24

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FSM-708-SLM-01 Rev.04 Issue date: 5/6/24



Certificate No : 24-SLM-238
Request No : Req-2024-1457

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
FAST / A / 37-139	Level	UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)			
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)			
1000 Hz (114 dB)	113.76	114.1	0.34	113.8	+0.04	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN: 50079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(\pm dB)
A	25.4	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(\pm dB)
A	24.8	0.10
C	24.3	0.10
Z	28.6	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
	A	C	Z			
FAST / 37-139	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
STD Setting	(dB)	(dB)	(dB)			
125 Hz	0.1	0.2	0.2	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	0.6	0.6	0.6	0.60	3.0	Pass
8000 Hz	0.8	0.8	0.9	0.70	5.0	Pass



Certificate No : 24-SLM-238
Request No : Req-2024-1457

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 (\pm dB)	Acceptance Limit (\pm dB)	Result
FAST / 37-139	A	C	Z			
STD Setting	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
63 Hz	-0.2	-0.1	-0.1	0.20	2.0	Pass
125 Hz	-0.1	0.0	-0.1		1.5	Pass
250 Hz	-0.1	0.0	-0.1		1.5	Pass
300 Hz	-0.1	0.0	-0.1		1.5	Pass
1000 Hz	0.0	0.0	-0.1		1.0	Pass
2000 Hz	0.0	0.0	0.0		2.0	Pass
4000 Hz	0.0	0.0	0.0		3.0	Pass
8000 Hz	-0.1	-0.1	0.0		5.0	Pass
16000 Hz	-0.1	-0.1	-0.1		+5, -10T	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
FAST / 37-139	REF	UUC (dB)	ERR (dB)			
UUC Weighting	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0		0.20	Pass
Z	114.00	114.0	0.0		0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
37-139 / A	REF	UUC (dB)	ERR (dB)			
UUC Time Response	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
Fast	114.00	114.0	0.0	0.20	0.10	Pass
Slow	114.00	114.0	0.0		0.10	Pass
Log	114.00	114.0	0.0		0.10	Pass



Certificate No : 24-SLM-238
Request No : Req-2024-1457

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
FAST / A / 37-139	UUC (dB)			
STD Setting	(dB)	(\pm dB)	(\pm dB)	
Initial	114.0	0.10	0.30	Pass
Final	114.0			
Deviated	0.0			

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
FAST / A / 37-139	REF	UUC (dB)	ERR (dB)			
STD dB	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
117.00	137	137.0	0.0	0.30	1.1	Pass
134.00	134	134.0	0.0		1.1	Pass
129.00	129	129.0	0.0		1.1	Pass
124.00	124	124.0	0.0		1.1	Pass
119.00	119	119.0	0.0		1.1	Pass
114.00	114	114.0	0.0		1.1	Pass
109.00	109	109.0	0.0		1.1	Pass
104.00	104	104.0	0.0		1.1	Pass
99.00	99	99.0	0.0		1.1	Pass
94.00	94	93.9	-0.1		1.1	Pass
89.00	89	88.9	-0.1	0.30	1.1	Pass
84.00	84	83.9	-0.1		1.1	Pass
79.00	79	78.9	-0.1		1.1	Pass
74.00	74	73.9	-0.1		1.1	Pass
69.00	69	68.9	-0.1		1.1	Pass
64.00	64	63.9	-0.1		1.1	Pass
59.00	59	58.9	-0.1		1.1	Pass
54.00	54	53.9	-0.1		1.1	Pass
49.00	49	48.9	-0.1		1.1	Pass
44.00	44	44.0	0.0		1.1	Pass
39.00	39	39.1	0.1	0.30	1.1	Pass
38.00	38	38.2	0.2		1.1	Pass
37.00	37	37.2	0.2		1.1	Pass
36.00	36	36.3	0.3		1.1	Pass
35.00	35	35.4	0.4		1.1	Pass



Certificate No : 24-SLM-238
Request No : Req-2024-1457

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
FAST / A	REF	UUC (dB)	ERR (dB)			
UUC Range	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
37-139	40.10	40.2	0.1	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
A / 37-139	Toneburst	Ref	UUC (dB)	ERR (dB)			
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
Fast	200	135.0	135.0	0.0	0.20	1.0	Pass
	2	118.0	117.9	-0.1		+1.0, -2.5	Pass
	0.25	109.0	108.8	-0.4		+1.5, -5.0	Pass
Slow	200	128.6	128.5	-0.1		1.0	Pass
	2	109.0	108.9	-0.1		+1.0, -5.0	Pass
	200	129.0	129.0	0.0		1.0	Pass
SEL	2	109.0	109.0	0.0		+1.0, -2.5	Pass
	0.25	100.0	99.8	-0.2		+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
FAST / C / 95-142	REF	UUC (dB)	ERR (dB)			
STD Setting	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
Complete cycle	137.4	136.6	-0.80	0.20	3.0	Pass
Positive half cycle	136.4	136.2	-0.20		2.0	Pass
Negative half cycle	136.4	136.2	-0.20		2.0	Pass



Certificate No : 24-SLM-238
Request No : Req-2024-1457

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance	Result
FAST / A / 37-139	UUC		Limit	
STD Setting	(dB)		(\pm dB)	
Positive one-half cycle	138.8			
Negative one-half cycle	138.7			
Deviated	0.1	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance	Result
FAST / A / 37-139	UUC		Limit	
STD Setting	(dB)	(± dB)		
Initial	138.0			
Final	138.0			
Deviated	0.0	0.10	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 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at ~4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1 kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

> Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-1:2013

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Laboratory.
EN-708-SLM-01 Rev.04 Issue date: 5/6/24

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Certificate No : 24-SLM-238
Request No : Req-2024-1457

Decision Rule for Statements of Conformity

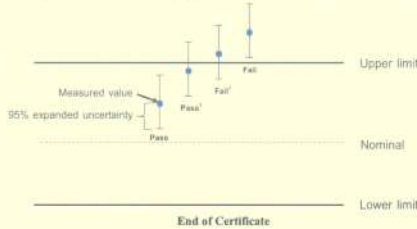
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:08:2016 Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limits

Pass¹ - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit

Fail¹ - The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit

Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability were 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 Calibration Laboratory.
EN-708-SLM-01 Rev.04 Issue date: 5/6/24

เอกสารไม่ควบคุม



Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 24-SLM-231
Request No : Req-2024-1450

Unit Under Calibration Details

Measurement Item : Sound Level Meter
Manufacturer : Larson Davis
Model : LXT2
Serial Number : 0005293
ID : UAE-EFM1082562
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 375B92
Microphone S/N : 11792
Preamplifier Model : PRM1x12B
Preamplifier S/N : 056073
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C \pm 2 °C
Humidity : 50 %RH \pm 20 %RH
Barometric Pressure : 1013 hPa \pm 10 hPa
Received Date : 1 July 2024
Calibrated Date : 10 July 2024
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-1:2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	388273	20 August 2024	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	Svanick	Svan401	131	8 October 2024	WK Electric

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. Noppadon Luangrit
Service Calibration Engineer

Approved By :
Mr. Pait Mahavorn
Calibration Engineer Supervisor
Issue Date : 10 July 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Laboratory.
EN-708-SLM-01 Rev.04 Issue date: 5/6/24

เอกสารไม่ควบคุม



Certificate No : 24-SLM-231
Request No : Req-2024-1450

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR			
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(\pm dB)	Limit (\pm dB)	
1000 Hz 114 dB	113.76	114.3	0.54	113.8	+0.04	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(\pm dB)
UUC Weighting	(dB)	(\pm dB)
A	29.8	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(\pm dB)
UUC Weighting	(dB)	(\pm dB)
A	29.4	0.10
C	28.8	0.10
Z	32.9	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
	A	C	Z			
FAST / 37-139	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
STD Setting	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
125 Hz	0.0	0.1	0.1	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	0.7	0.7	0.7	0.60	3.0	Pass
8000 Hz	1.4	1.4	1.5	0.70	3.0	Pass ¹

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Laboratory.
EN-708-SLM-01 Rev.04 Issue date: 5/6/24

เอกสารไม่ควบคุม

Certificate No : 24-SLM-231
Request No : Req-2024-1450

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance	Result
FAST / 37-139	Weighting Responce curve				Limit	
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)	
63 Hz	-0.2	-0.1	-0.1	0.20	±0.0	Pass
125 Hz	-0.1	0.0	-0.1		±0.5	Pass
250 Hz	-0.1	0.0	-0.1		±1.5	Pass
500 Hz	-0.1	0.0	-0.1		±1.5	Pass
1000 Hz	0.0	0.0	-0.1		±1.0	Pass
2000 Hz	0.0	0.0	0.0		±2.0	Pass
4000 Hz	0.0	0.0	0.0		±3.0	Pass
8000 Hz	-0.1	-0.1	0.0		±5.0	Pass
16000 Hz	-0.1	-0.1	-0.1		+5, -INF	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		UUC	ERR			
FAST / 37-139	REF	UUC	ERR	0.20	± 0.20	Pass
UUC Weighting	(dB)	(dB)	(dB)			
A	114.00	114.0	0.0			
C	114.00	114.0	0.0			
Z	114.00	114.0	0.0			

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		UUC	ERR			
37-139 / A	REF	UUC	ERR	0.20	± 0.10	Pass
UUC Time Responce	(dB)	(dB)	(dB)			
Fast	114.00	114.0	0.0			
Slow	114.00	114.0	0.0			
1sq	114.00	114.0	0.0			

Certificate No : 24-SLM-231
Request No : Req-2024-1450

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	UUC	(± dB)	Limit (± dB)	Pass
STD Setting	(dB)			
Initial	114.0			
Final	114.0	0.10	0.30	Pass
Deviated	0.0			

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139		REF	UUC			
STD dB	(dB)	(dB)	(dB)	(dB)		
130.00	130	130.0	0.0	0.30	1.1	Pass
134.00	134	134.0	0.0		1.1	Pass
120.00	120	120.0	0.0		1.1	Pass
124.00	124	124.0	0.0		1.1	Pass
110.00	110	110.0	0.0		1.1	Pass
114.00	114	114.0	0.0		1.1	Pass
100.00	100	100.0	0.0		1.1	Pass
104.00	104	104.0	0.0		1.1	Pass
90.00	90	90.0	-0.1		1.1	Pass
94.00	94	93.9	-0.1		1.1	Pass
80.00	80	80.0	-0.1		1.1	Pass
84.00	84	83.9	-0.1		1.1	Pass
70.00	70	70.0	-0.1		1.1	Pass
74.00	74	73.9	-0.1		1.1	Pass
60.00	60	60.0	-0.1		1.1	Pass
64.00	64	63.9	-0.1		1.1	Pass
50.00	50	50.0	-0.1		1.1	Pass
54.00	54	53.9	-0.1		1.1	Pass
40.00	40	40.0	0.0		1.1	Pass
44.00	44	44.1	0.1		1.1	Pass
30.00	30	30.0	0.0		1.1	Pass

Certificate No : 24-SLM-231
Request No : Req-2024-1450

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance	Result
FAST / A		REF	UUC		ERR	
UUC Range	(dB)	(dB)	(dB)	(± dB)	(± dB)	
37-139	44.80	44.9	0.1	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance	Result
	Toneburst	Ref	UUC	ERR		Limit (± dB)	
A / 37-139							
UUC Time Response	(ms)	(dB)	(dB)	(dB)			
Fast	200	135.0	135.0	0.0	0.20	1.0	Pass
	2	118.0	117.9	-0.1		+1.0, -2.5	Pass
	0.25	100.0	100.6	-0.4		+1.5, -5.0	Pass
Slow	200	128.6	128.5	-0.1		1.0	Pass
	2	109.0	108.9	-0.1		+1.0, -5.0	Pass
	200	129.0	129.0	0.0		1.0	Pass
SEL	2	109.0	109.1	+0.1		+1.0, -2.5	Pass
	0.25	100.0	99.8	-0.2		+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / C / 95-142		REF (dB)	UUC (dB)			
STD Setting				0.20		
Complete cycle	137.4	136.7	-0.70		3.0	Pass
Positive half cycle	136.4	136.2	-0.20		2.0	Pass
Negative half cycle	136.4	136.2	-0.20		2.0	Pass

Certificate No : 24-SLM-231
Request No : Req-2024-1450

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	UUC	(± dB)	Limit (± dB)	Pass
STD Setting	(dB)			
Positive one-half cycle	143.7			
Negative one-half cycle	143.8	0.20	1.5	Pass
Deviated	-0.1			

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	UUC	(± dB)	Limit (± dB)	Pass
STD Setting	(dB)			
Initial	138.0			
Final	138.0	0.10	0.30	Pass
Deviated	0.0			

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 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Second level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

* Acceptance limit and Maximum-permitted Uncertainty was IEC 61072-1:2013

Certificate No : 24-SLM-231
Request No : Req-2024-1450

Decision Rule for Statements of Conformity

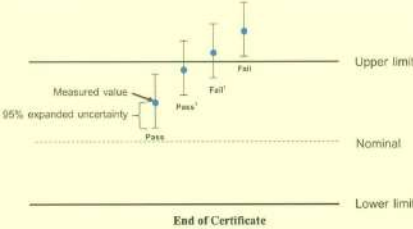
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-Q8:09:2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements:

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Engineer. **เอกสารไม่ควบคุม**
FSI-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-232
Request No : Req-2024-1451

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust			After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
	Level	UUC	ERR	ERR	UUC	ERR			
Calibrator Setting (dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)			
1009 Hz 114 dB	113.76	114.3	0.54	113.8	+0.04	0.20	0.30	Pass	

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	29.7	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	29.4	0.10
C	29.0	0.10
Z	33.0	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
	A	C	Z			
FAST / 37-139 STD Setting (dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)	
125 Hz	0.0	0.1	0.1	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	0.6	0.5	0.6	0.60	3.0	Pass
8000 Hz	1.0	0.9	1.0	0.70	5.0	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Engineer. **เอกสารไม่ควบคุม**
FSI-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address : 81 Soi Udomrak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260
Certificate No : 24-SLM-232
Request No : Req-2024-1451

Unit Under Calibration Details

Measurement item : Sound Level Meier
Manufacturer : Larson Davis
Model : LX72
Serial Number : 0005341
ID : UAEFFM.038/2563
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 375802
Microphone S/N : 11793
Preamplifier Model : PRMLx72B
Preamplifier S/N : 056133
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 : 1 July 2024
Calibrated Date : 10 July 2024
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-1 : 2013 Electroacoustics - Sound level meters - Part 1: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	198273	20 August 2024	GRAS
Multifrequency Calibrator	Quest	Questcal	EFA000234	26 July 2024	TSI
Audio Generator	SvanteK	Svan401	131	8 October 2024	WK Electric

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. Noppadon Luangrit
Service Calibration Engineer

Approved By : 
Mr. Paet Muthavorn
Calibration Engineer Supervisor
Issue Date : 10 July 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Engineer. **เอกสารไม่ควบคุม**
FSI-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-232
Request No : Req-2024-1451

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 (± dB)	Acceptance Limit (± dB)	Result
FAST / 37-139 STD Setting	A (dB)	C (dB)	Z (dB)			
63 Hz	-0.2	-0.1	-0.1	0.20	2.0	Pass
125 Hz	-0.1	0.0	-0.1		1.5	Pass
250 Hz	-0.1	0.0	-0.1		1.5	Pass
500 Hz	-0.1	0.0	-0.1		1.5	Pass
1000 Hz	0.0	0.0	-0.1		1.0	Pass
2000 Hz	0.0	0.0	0.0		2.0	Pass
4000 Hz	0.0	0.0	0.0		3.0	Pass
8000 Hz	-0.1	-0.1	0.0		5.0	Pass
16000 Hz	-0.1	-0.1	-0.1		+5, -INF.	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / 37-139 UUC Weighting	REF (dB)	UUC (dB)	ERR (dB)			
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0		0.20	Pass
Z	114.00	114.0	0.0		0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
37-139 / A UUC Time Response	REF (dB)	UUC (dB)	ERR (dB)			
Fast	114.00	114.0	0.0	0.20	0.10	Pass
Slow	114.00	114.0	0.0		0.10	Pass
Log	114.00	114.0	0.0		0.10	Pass

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FSI-708-SLM-01 Rev.04 Issue date 5/6/24

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 37-139	UUC	(± dB)	(± dB)	
STD Setting	(dB)			
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.30	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 37-139	REF	UUC	ERR	(± dB)	
STD dB	(dB)	(dB)	(dB)		
139.00	139	139.0	0.0		
134.00	134	134.0	0.0		
129.00	129	129.0	0.0	0.50	Pass
124.00	124	124.0	0.0		Pass
119.00	119	119.0	0.0		Pass
114.00	114	114.0	0.0		Pass
109.00	109	109.0	0.0		Pass
104.00	104	104.0	0.0		Pass
99.00	99	99.0	0.0		Pass
94.00	94	94.0	0.0		Pass
89.00	89	89.0	0.0		Pass
84.00	84	84.0	0.0		Pass
79.00	79	79.0	0.0		Pass
74.00	74	74.0	0.0		Pass
69.00	69	69.0	0.0		Pass
64.00	64	64.0	0.0		Pass
59.00	59	59.0	0.0		Pass
54.00	54	54.0	0.0		Pass
49.00	49	49.1	0.1		Pass
44.00	44	44.2	0.2		Pass
39.00	39	39.5	0.5		Pass

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9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A	REF	UUC	ERR	(± dB)	
UUC Range	(dB)	(dB)	(dB)		
37-139	44.20	44.3	0.1		Pass
	114	114.0	0.0		Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance Limit	Result
A / 37-139	Touchburst	Ref	UUC	ERR	(± dB)	
UUC Time Response	(ms)	(dB)	(dB)	(dB)		
Fast	200	135.0	135.0	0.0		Pass
	2	118.0	117.8	-0.2		Pass
	0.25	109.0	108.5	-0.5	0.20	Pass
Slow	200	128.6	128.4	-0.2		Pass
	2	109.0	108.5	-0.2		Pass
	0.25	109.0	109.0	0.0		Pass
SEL	200	129.0	129.0	0.0	0.20	Pass
	2	109.0	109.0	0.0		Pass
	0.25	100.0	99.7	-0.3		Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / C / 95-142	REF	UUC	ERR	(± dB)	
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	137.4	136.8	-0.60		Pass
Positive half cycle	138.4	136.2	-0.20		Pass
Negative half cycle	138.4	136.2	-0.20	2.0	Pass

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12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 37-139	UUC	(± dB)	(± dB)	
STD Setting	(dB)			
Positive one-half cycle	143.2			
Negative one-half cycle	143.3			
Deviated	-0.1	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
FAST / A / 37-139	UUC	(± dB)	(± dB)	
STD Setting	(dB)			
Initial	138.0			
Final	138.0			
Deviated	0.0	0.10	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 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

~ Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-1:2013

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Decision Rule for Statements of Conformity

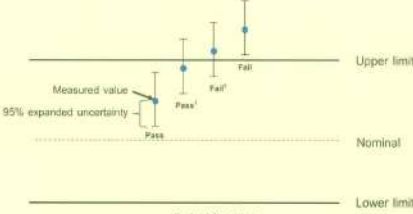
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass ~ The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ ~ The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ ~ The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail ~ The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

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FSM-708-SLM-01 Rev.04 Issue date: 5/6/24

Certificate of Calibration

Customer

Name

UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Certificate No : 24-SLM-235

Address

81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Request No : Req-2024-1454

Unit Under Calibration Details

Measurement Item

Sound Level Meter

Microphone Class : 2

Manufacturer

Larson Davis

Microphone Model : 375B02

Model

LxT2

Microphone S/N : 11798

Serial Number

0065346

Preamplifier Model : PRMLxT2B

ID

UALEFM.0432563

Preamplifier S/N : 036138

Resolution

0.1 dB

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

1 July 2024

Calibrated Date

10 July 2024

Calibration Procedure

In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests

Location of Calibration

Lab Acoustic


Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	29 August 2024	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	IFA000234	26 July 2024	TSI
Audio Generator	Svantek	Svan401	131	8 October 2024	WK Electric

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. Noppadon Luangran
Service Calibration Engineer

Approved By :



Mr. Pachi Mathavom
Calibration Engineer Supervisor

Issue Date :

10 July 2024

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F30-700-SLM-01 Rev.04 Issue Date 5/6/24

Certificate No : 24-SLM-235

Request No : Req-2024-1454

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	Level	UUC	ERR	UUC	ERR	(± dB)	Limit	
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		(± dB)	
1000 Hz 114 dB	113.76	115.3	1.54	113.8	+0.04	0.20	0.30	Pass

Note :

Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTER, Model SV 35A, SN. 38079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting	(dB)	(± dB)
A	31.4	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting	(dB)	(± dB)
A	31.1	0.10
C	30.5	0.10
Z	35.0	0.10

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




UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance	Result
FAST / 37-139	A	C	Z	(± dB)	Limit	
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
125 Hz	0.0	0.1	0.1	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	1.1	1.1	1.1	0.60	3.0	Pass
8000 Hz	2.6	2.5	2.6	0.70	5.0	Pass

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F30-700-SLM-01 Rev.04 Issue Date 5/6/24

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/139 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAO,
AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAN
TEL : 0669-2116-5600-1 FAX: 0669-2116-7140



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Certificate No : 24-SLM-235

Request No : Req-2024-1454

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	Acceptance	Result
FAST / 37-139	A	C	Z	(± dB)	Limit	
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
63 Hz	-0.1	0.0	0.1	0.20	2.0	Pass
125 Hz	-0.1	0.0	0.0	0.20	1.5	Pass
250 Hz	-0.1	0.0	0.0	0.20	1.5	Pass
500 Hz	0.0	0.1	0.0	0.20	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.20	1.0	Pass
2000 Hz	0.0	0.1	0.0	0.20	2.0	Pass
4000 Hz	0.0	-0.1	0.0	0.20	3.0	Pass
8000 Hz	-0.1	-0.1	0.0	0.20	5.0	Pass
16000 Hz	-0.1	-0.1	-0.1	0.20	+5, -INF	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance	Result
FAST / 37-139	REF	UUC	ERR	(± dB)	Limit	
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0	0.20	0.20	Pass
Z	114.00	114.0	0.0	0.20	0.20	Pass




UUC Setting	STD	Measured		UNCERTAINTY	Acceptance	Result
37-139 / A	REF	UUC	ERR	(± dB)	Limit	
UUC Time Response	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Fast	114.00	114.0	0.0	0.20	0.10	Pass
Slow	114.00	114.0	0.0	0.20	0.10	Pass
1eq	114.00	114.0	0.0	0.20	0.10	Pass

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AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAN
TEL : 0669-2116-5600-1 FAX: 0669-2116-7140



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Certificate No : 24-SLM-235

Request No : Req-2024-1454

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	UUC	(± dB)	Limit	
STD Setting	(dB)	(± dB)	(± dB)	
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.30	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	REF	UUC	ERR	(± dB)	Limit	
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)	
139.00	139	139.0	0.0	0.30	1.1	Pass
134.00	134	134.0	0.0	0.30	1.1	Pass
129.00	129	129.0	0.0	0.30	1.1	Pass
124.00	124	124.0	0.0	0.30	1.1	Pass
119.00	119	119.0	0.0	0.30	1.1	Pass
114.00	114	114.0	0.0	0.30	1.1	Pass
109.00	109	109.0	0.0	0.30	1.1	Pass
104.00	104	104.0	0.0	0.30	1.1	Pass
99.00	99	99.0	0.0	0.30	1.1	Pass
94.00	94	94.0	0.0	0.30	1.1	Pass
89.00	89	89.0	0.0	0.30	1.1	Pass
84.00	84	84.0	0.0	0.30	1.1	Pass
79.00	79	79.0	0.0	0.30	1.1	Pass
74.00	74	74.0	0.0	0.30	1.1	Pass
69.00	69	69.0	0.0	0.30	1.1	Pass
64.00	64	64.0	0.0	0.30	1.1	Pass
59.00	59	59.0	0.0	0.30	1.1	Pass
54.00	54	54.0	0.0	0.30	1.1	Pass
49.00	49	49.1	0.1	0.30	1.1	Pass
44.00	44	44.2	0.2	0.30	1.1	Pass
41.00	43	43.3	0.3	0.30	1.1	Pass
42.00	42	42.3	0.3	0.30	1.1	Pass
41.00	41	41.4	0.4	0.30	1.1	Pass

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F30-700-SLM-01 Rev.04 Issue Date 5/6/24

Certificate No.: 24-SLM-235

Request No.: Req-2024-1454

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance	Result
FAST / A	REF	UUC	ERR		Limit	
UUC Range	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
37-139	46.40	46.5	0.1	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
A / 37-139	Toneburst	Ref	UUC (dB)	ERR (dB)			
UUC Time Response	(ms)						
Fast	200	135.0	134.9	-0.1	0.20	1.0	Pass
	2	118.0	117.6	-0.4		+1.0, -2.5	Pass
	0.25	109.0	108.5	-0.5		+1.5, -5.0	Pass
Slow	200	128.6	128.4	-0.2		1.0	Pass
	2	109.0	108.8	-0.2		+1.0, -5.0	Pass
	200	129.0	129.0	0.0		1.0	Pass
SEL	2	109.0	108.8	-0.2		+1.0, -2.5	Pass
	0.25	100.0	99.7	-0.3		+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance	Result
FAST / C / 95-142	REF (dB)	UUC (dB)	ERR (dB)		Limit (± dB)	
STD Setting						
Complete cycle	137.4	136.8	-0.60	0.20	3.0	Pass
Positive half cycle	136.4	136.2	-0.20		2.0	Pass
Negative half cycle	136.4	136.2	-0.20		2.0	Pass

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FM-700-SLM-01 Rev.04 Issue date: 5/9/24

Certificate No.: 24-SLM-235

Request No.: Req-2024-1454

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit	Result
FAST / A / 37-139	UUC (dB)		(± dB)	
STD Setting				
Positive one-half cycle	145.4			
Negative one-half cycle	145.3			
Deviated	0.1	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance	Result
FAST / A / 37-139	UUC		Limit	
STD Setting	(dB)	(± dB)	(± dB)	
Initial	128.0			
Final	128.0			
Deviated	0.0	0.10	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 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1 kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

* Acceptance limit and Maximum permitted Uncertainty was IEC 61072-1:2013

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FM-700-SLM-01 Rev.04 Issue date: 5/9/24

Certificate No.: 24-SLM-235

Request No.: Req-2024-1454

Decision Rule for Statements of Conformity

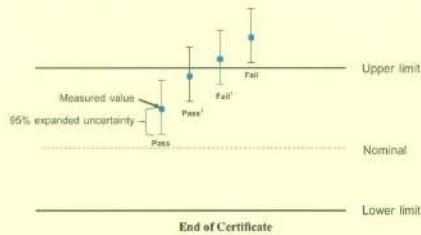
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-48/09:2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



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FM-700-SLM-01 Rev.04 Issue date: 5/9/24



ELECTRICAL AND ELECTRONICS INSTITUTE FOUNDATION FOR INDUSTRIAL DEVELOPMENT

975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,

Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280

Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20240292EA

Operation No.: CP2024070255

Certificate of Calibration

Equipment:	Sound Level Meter
Manufacturer:	Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type:	LxT2 (Meter), 375B02 (Microphone), PRLxT2B (Preamplifier)
Serial No.:	0005348 (Meter), 11800 (Microphone), 056140 (Preamplifier)
ID No.:	UAE.EFM.045/2563
Customer:	United Analyst and Engineering Consultant Co.,Ltd.
Address:	81 Soi Udumsuk 41, Sukhumvit Road, Bangchak Phrakhanong, Bangkok 10260
Received Date:	25 July 2024
Calibrated Date:	6 - 7 August 2024
Issued Date:	7 August 2024
Calibrated by:	Ms. Juntaporn Kunhakom

Approved by:
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature, Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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Certificate No.: CP20240292EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT2 (Meter), 375B02 (Microphone), PRMLxT2B (Preamplifier)
Serial No.: 0005348 (Meter), 11800 (Microphone), 056140 (Preamplifier)
ID No.: UAE EFM.045/2563
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-

IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

	Instrument	Model	Serial No.	Cert. No.	Due Date
1)	Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2)	Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3)	Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4)	6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5)	Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6)	Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7)	Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

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F-CAL-005 Ed.1

Certificate No.: CP20240292EA

Calibration Report

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.3

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
99.0	99.0	0.0	±1.1
104.0	104.0	0.0	±1.1
109.0	109.0	0.0	±1.1
114.0	114.0	0.0	±1.1
119.0	119.0	0.0	±1.1
124.0	124.0	0.0	±1.1
129.0	129.0	0.0	±1.1
134.0	134.1	0.1	±1.1
139.0	139.1	0.1	±1.1
140.0	140.1	0.1	±1.1
141.0	141.1	0.1	±1.1
142.0	142.1	0.1	±1.1

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F-CAL-005 Ed.1

Certificate No.: CP20240292EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
31.6

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	31.5
C-weighting	31.6
Z-weighting	36.6

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.3	0.2	0.2	±1.5
1000	-0.2	-0.2	-0.2	±1.0
8000	2.9	2.9	2.9	±5.0

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	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	0.1	0.0	0.0	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.1	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	0.0	0.0	0.1	±5.0

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

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F-CAL-005 Ed.1

Certificate No.: CP20240292EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±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	44.1	0.1	±1.1
43.0	43.2	0.2	±1.1
42.0	42.3	0.3	±1.1
41.0	41.4	0.4	±1.1
40.0	40.5	0.5	±1.1

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±1.0
	2	118.8	-0.2	+1.0 ; -2.5
	0.25	109.7	-0.3	+1.5 ; -5.0
Slow	200	129.5	-0.1	±1.0
	2	109.9	-0.1	+1.0 ; -5.0
LAE	200	130.0	0.0	±1.0
	2	110.0	0.0	+1.0 ; -2.5
	0.25	100.9	-0.1	+1.5 ; -5.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±3.0
Positive half cycle	134.4	134.1	-0.3	±2.0
Negative half cycle	134.4	134.1	-0.3	±2.0

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
145.3	145.2	-0.1	±1.5

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ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240292EA

Calibration Report

Function : 11. High-Level Stability

High-Level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.3

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.55
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

- Remarks:
- Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
 - The acceptance limit is for the deviated value.
 - Acceptance limits was IEC61672-3:2013 Class 2.
 - The coverage factor $k = 2.00$

-- End of Report --

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INNOVATIVE INSTRUMENT CALIBRATION LAB

INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE

7139 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KALU,

AMPHOE BANG PHU SAKET PRAKAN PROVINCE 10540 THAILAN

TEL: 0660-2116-5900-1 FAX: 0660-2116-7140



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Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 24-SLM-228

Request No : Req-2024-1447

Unit Under Calibration Details

Measurement item : Sound Level Meter
Microphone Class : 2
Manufacturer : Larson Davis
Microphone Model : 375A04
Model : LX72
Microphone S/N : 335073
Serial Number : 0006092
Preamplifier Model : PBMLX72C
ID : UAE-EFM132/2565
Preamplifier S/N : 071560
Resolution : 0.1 dB
Instrument Status : Used

Calibration Environment and Details

Temperature : 23.7 °C ± 0.2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 1 July 2024
Calibrated Date : 9 July 2024
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	20 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	Swank	Scan401	131	8 October 2024	WK Electric

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. Noppan Luangrat
Service Calibration Engineer

Approved By :

Mr. Pasi Malivorn
Calibration Engineer Supervisor

Issue Date : 9 July 2024

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FSM-708-SLM-01 Rev.04 Issue Date 5/6/24

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7139 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KALU,

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TEL: 0660-2116-5900-1 FAX: 0660-2116-7140



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Certificate No : 24-SLM-228

Request No : Req-2024-1447

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)			
Calibrator Setting	(dB)							
1000 Hz 134 dB	113.76	114.8	1.04	113.8	+0.04	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN: 58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	28.8	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	28.7	0.10
C	28.4	0.10
Z	33.0	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
	A	C	Z			
FAST / 37-139	(dB)	(dB)	(dB)			
STD Setting						
125 Hz	0.2	0.3	0.2	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	0.6	0.5	0.6	0.60	3.0	Pass
8000 Hz	1.0	1.0	1.1	0.70	5.0	Pass

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FSM-708-SLM-01 Rev.04 Issue Date 5/6/24

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TEL: 0660-2116-5900-1 FAX: 0660-2116-7140



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Certificate No : 24-SLM-228

Request No : Req-2024-1447

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 (± dB)	Acceptance Limit (± dB)	Result
	A	C	Z			
FAST / 37-139	(dB)	(dB)	(dB)			
STD Setting						
63 Hz	-0.1	0.0	0.0	0.20	2.0	Pass
125 Hz	-0.1	0.1	0.0		1.5	Pass
250 Hz	0.0	0.0	0.0		1.5	Pass
500 Hz	0.0	0.1	0.0		1.5	Pass
1000 Hz	0.0	0.0	0.0		1.0	Pass
2000 Hz	0.1	0.1	0.1		2.0	Pass
4000 Hz	0.0	0.1	0.1		3.0	Pass
8000 Hz	0.0	0.0	0.1		5.0	Pass
16000 Hz	0.0	0.0	-0.1		+5, -INF	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		REF (dB)	ERR (dB)			
FAST / 37-139						
UUC Weighting						
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0		0.20	Pass
Z	114.00	114.0	0.0		0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		REF (dB)	ERR (dB)			
37-139 / A						
UUC Time Response						
Fast	114.00	114.0	0.0	0.20	0.10	Pass
Slow	114.00	114.0	0.0		0.10	Pass
Lsq	114.00	114.0	0.0		0.10	Pass

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FSM-708-SLM-01 Rev.04 Issue Date 5/6/24

Certificate No : 24-SLM-228
Request No : Req-2024-1447

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	UUC	(± dB)	Limit (± dB)	Result
STD Setting	(dB)			
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.30	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	REF	UUC	ERR	Limit	Result
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)
130.00	130	130.0	0.0	1.1	Pass
134.00	134	134.0	0.0	1.1	Pass
129.00	129	129.0	0.0	1.1	Pass
124.00	124	124.0	0.0	1.1	Pass
119.00	119	119.0	0.0	1.1	Pass
114.00	114	114.0	0.0	1.1	Pass
109.00	109	109.0	0.0	1.1	Pass
104.00	104	104.0	0.0	1.1	Pass
99.00	99	98.9	-0.1	1.1	Pass
94.00	94	93.9	-0.1	1.1	Pass
89.00	89	88.9	-0.1	1.1	Pass
84.00	84	83.9	-0.1	1.1	Pass
79.00	79	78.9	-0.1	1.1	Pass
74.00	74	73.9	-0.1	1.1	Pass
69.00	69	68.9	-0.1	1.1	Pass
64.00	64	63.9	-0.1	1.1	Pass
59.00	59	58.9	-0.1	1.1	Pass
54.00	54	53.9	-0.1	1.1	Pass
49.00	49	49.0	0.0	1.1	Pass
44.00	44	44.0	0.0	1.1	Pass
39.00	39	39.1	0.1	1.1	Pass
34.00	34	34.4	0.4	1.1	Pass

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FSM-700-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-228
Request No : Req-2024-1447

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance	Result
FAST / A	REF	UUC	ERR	Limit	Result
UUC Range	(dB)	(dB)	(dB)	(± dB)	(± dB)
37-139	43.00	44.0	0.1	1.1	Pass
	134	134.0	0.0	1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance	Result
A / 37-139	Toneburst	Ref	UUC	ERR	Limit	Result
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	200	155.0	155.0	0.0	1.0	Pass
	2	118.0	117.8	-0.2	+1.0, -2.5	Pass
	0.25	109.0	108.8	-0.2	+1.5, -5.0	Pass
Slow	200	128.6	128.5	-0.1	1.0	Pass
	2	109.0	108.9	-0.1	+1.0, -5.0	Pass
SEL	200	129.0	129.0	0.0	1.0	Pass
	2	109.0	109.0	0.0	+1.0, -2.5	Pass
	0.25	100.0	100.0	0.0	+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance	Result
FAST / C / 95-142	REF	UUC	ERR	Limit	Result
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
Complete cycle	137.4	136.7	-0.70	3.0	Pass
Positive half cycle	136.4	136.2	-0.20	2.0	Pass
Negative half cycle	136.4	136.2	-0.20	2.0	Pass

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FSM-700-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-228
Request No : Req-2024-1447

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	UUC	(± dB)	Limit (± dB)	Result
STD Setting	(dB)			
Positive one-half cycle	142.8			
Negative one-half cycle	142.6			
Deviated	0.2	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	UUC	(± dB)	Limit (± dB)	Result
STD Setting	(dB)			
Initial	138.0			
Final	138.0			
Deviated	0.0	0.10	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 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

* Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-1:2013

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FSM-700-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 24-SLM-228
Request No : Req-2024-1447

Decision Rule for Statements of Conformity

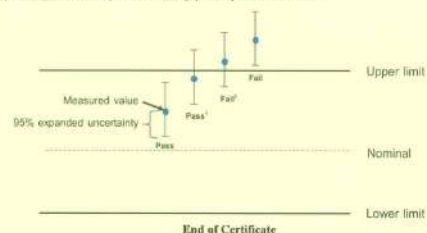
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09:2019: Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass¹ - The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass² - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail³ - The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail⁴ - The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



End of Certificate

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FSM-700-SLM-01 Rev.04 Issue date 5/6/24



Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok
10260

Certificate No : 24-SLM-239
Request No : Req-2024-1458

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : Larson Davis
Model : LX72
Serial Number : 0006756
ID : DAE-FM-032/2566
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 375A04
Microphone S/N : 346384
Preamplifier Model : PRML xT2C
Preamplifier S/N : 073885
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 : 2 July 2024
Calibrated Date : 11 July 2024
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics > Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	20 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	SvanteK	Svan401	131	8 October 2024	WK Electric

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
Service Calibration Engineer

Approved By :
Mr. Pacht Mathavorn
Calibration Engineer Supervisor
Issue Date : 11 July 2024

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

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Certificate No : 24-SLM-239
Request No : Req-2024-1458

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139 Calibrator Setting (dB)	Level (dB)	UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)			
1000 Hz 114 dB	113.76	115.1	1.34	113.8	+0.04	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN: 53079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
A	27.5	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
A	27.3	0.10
C	26.8	0.10
Z	31.0	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
	A (dB)	C (dB)	Z (dB)			
FAST / 37-139						
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
125 Hz	0.1	0.2	0.2	0.60	1.2	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	-0.7	-0.7	-0.7	0.60	3.0	Pass
8000 Hz	-1.7	-1.7	-1.6	0.70	5.0	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Engineer Supervisor.
FM-708-SLM-01 Rev.04 Issue date 5/6/24

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Certificate No : 24-SLM-239
Request No : Req-2024-1458

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 (± dB)	Acceptance Limit (± dB)	Result
	A (dB)	C (dB)	Z (dB)			
FAST / 37-139						
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
63 Hz	-0.2	-0.1	-0.1	0.20	2.0	Pass
125 Hz	-0.1	0.0	-0.1		1.5	Pass
250 Hz	-0.1	0.0	-0.1		1.5	Pass
500 Hz	-0.1	0.0	-0.1		1.5	Pass
1000 Hz	0.0	0.0	-0.1		1.0	Pass
2000 Hz	0.0	0.0	0.0		2.0	Pass
4000 Hz	0.0	0.0	0.0		3.0	Pass
8000 Hz	-0.1	-0.1	0.0		5.0	Pass
16000 Hz	-0.1	-0.1	-0.1		+5, -INF	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / 37-139	REF	UUC (dB)	ERR (dB)			
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.6	0.0	0.20	0.20	Pass
Z	114.00	114.0	0.0	0.20	0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
37-139 / A	REF	UUC (dB)	ERR (dB)			
UUC Time Response	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Fast	114.00	114.0	0.0	0.20	0.10	Pass
Slow	114.00	114.0	0.0	0.20	0.10	Pass
Eq	114.00	114.0	0.0	0.20	0.10	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Engineer Supervisor.
FM-708-SLM-01 Rev.04 Issue date 5/6/24

เอกสารไม่ควบคุม



Certificate No : 24-SLM-239
Request No : Req-2024-1458

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139	UUC (dB)			
STD Setting	(dB)	(± dB)	(± dB)	
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.30	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139	REF (dB)	UUC (dB)	ERR (dB)			
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)	
139.00	139	139.0	0.0	0.30	1.1	Pass
134.00	134	134.0	0.0		1.1	Pass
129.00	129	129.0	0.0		1.1	Pass
124.00	124	124.0	0.0		1.1	Pass
119.00	119	119.0	0.0		1.1	Pass
114.00	114	114.0	0.0		1.1	Pass
109.00	109	109.0	0.0		1.1	Pass
104.00	104	104.0	0.0		1.1	Pass
99.00	99	99.0	0.0		1.1	Pass
94.00	94	93.9	-0.1		1.1	Pass
89.00	89	88.9	-0.1		1.1	Pass
84.00	84	83.9	-0.1		1.1	Pass
79.00	79	78.9	-0.1		1.1	Pass
74.00	74	73.9	-0.1		1.1	Pass
69.00	69	68.9	-0.1		1.1	Pass
64.00	64	63.9	-0.1		1.1	Pass
59.00	59	58.9	-0.1		1.1	Pass
54.00	54	53.9	-0.1		1.1	Pass
49.00	49	49.0	0.0		1.1	Pass
44.00	44	44.0	0.0		1.1	Pass
39.00	39	39.3	0.3		1.1	Pass
34.00	34	34.3	0.3		1.1	Pass
29.00	29	29.4	0.4		1.1	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Calibration Engineer Supervisor.
FM-708-SLM-01 Rev.04 Issue date 5/6/24

เอกสารไม่ควบคุม

Certificate No : 24-SLM-239
Request No : Req-2024-1458

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance	Result
FAST / A	REF	UUC	ERR		Limit	
UUC Range	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
37-139	42.50	42.6	0.1	0.30	1.1	P220
	114	114.0	0.0		1.1	P225

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance	Result
A / 37-139	Timeburst	Ref.	UUC	ERR		Limit	
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)	
Fast	200	135.0	135.0	0.0	0.20	1.0	Pass
	2	118.0	117.8	-0.2		+1.0, -2.5	Pass
	0.25	109.0	108.6	-0.4		+1.5, -5.0	Pass
Slow	200	128.6	128.5	-0.1		1.0	Pass
	2	109.0	108.9	-0.1		+1.0, -5.0	Pass
	200	129.0	129.0	0.0		1.0	Pass
SEL	2	109.0	109.0	0.0		+1.0, -2.5	Pass
	0.25	100.0	99.8	-0.2		+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance	Result
FAST / C / 95-142	REF	UUC	ERR		Limit	
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Complete cycle	137.4	136.7	-0.70	0.20	3.0	Pass
Positive half cycle	136.4	136.2	-0.20		2.0	Pass
Negative half cycle	136.4	136.2	-0.20		2.0	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the client.
FSM-708-SLM-01 Rev.04 Issue date 5/6/24

เอกสารไม่ควบคุม

Certificate No : 24-SLM-239
Request No : Req-2024-1458

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 37-139	UUC		Limit	
STD Setting	(dB)	(\pm dB)	(\pm dB)	
Positive one-half cycle	141.3			
Negative one-half cycle	141.2			
Deviated	0.1	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance	Result
FAST / A / 37-139	UUC		Limit	
STD Setting	(dB)		(\pm dB)	
Initial	138.0			
Final	138.0			
Deviated	0.0	0.10	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 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighing network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1 kHz	0.20 dB
7. Long-Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

> Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-1:2013.

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the client.
FSM-708-SLM-01 Rev.04 Issue date 5/6/24

เอกสารไม่ควบคุม

Certificate No : 24-SLM-239
Request No : Req-2024-1458

Decision Rule for Statements of Conformity

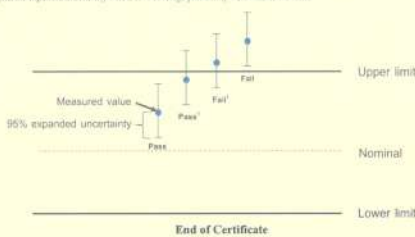
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09:2019 Guidelines on the Reporting of Compliance with Specification as following Fig. and statements.

Pass - The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ - The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ - The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomrak 41, Sakhuvit Road, Bangchak, Prakanong, Bangkok 10260

Certificate No : 24-SLM-214
Request No : Req-2024-1379

Unit Under Calibration Details

Measurement Item : Sound Level Meter
Manufacturer : Larson Davis
Model : LxT2
Serial Number : 0005398
ID : UAE.EFM.035/264
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 375A04
Microphone S/N : 338875
Preamplifier Model : PRMLxT2C
Preamplifier S/N : 073793
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C \pm 2 °C
Humidity : 50 %RH \pm 20 %RH
Barometric Pressure : 1013 hPa \pm 10 hPa
Received Date : 24 June 2024
Calibrated Date : 2 July 2024
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-1:2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	20 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	28 July 2024	TSI
Audio Generator	Svante	Svante401	131	8 October 2024	WK Electric

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. Noppadon Luangrat
Service Calibration Engineer

Approved By :
Mr. Paet Muthavorn
Calibration Engineer Supervisor
Issue Date : 2 July 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the client.
FSM-708-SLM-01 Rev.04 Issue date 5/6/24

เอกสารไม่ควบคุม

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the client.
FSM-708-SLM-01 Rev.04 Issue date 5/6/24

เอกสารไม่ควบคุม

Certificate No : 24-SLM-214
Request No : Req-2024-1379

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139	Level	UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)			
Calibrator Setting (dB)								
1000 Hz 114 dB	113.76	114.0	0.24	113.8	-0.04	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	28.8	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	28.1	0.10
C	27.9	0.10
Z	32.1	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / 37-139	A	C	Z			
STD Setting (dB)	(dB)	(dB)	(dB)			
125 Hz	-0.1	0.1	0.1	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	0.6	0.6	0.6	0.60	3.0	Pass
8000 Hz	0.5	0.4	0.4	0.70	5.0	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing body.
เอกสารไม่ควบคุม

File: 708-51.34-01 Rev.04 Issue date: 5/6/24

Certificate No : 24-SLM-214
Request No : Req-2024-1379

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 (± dB)	Acceptance Limit (± dB)	Result
FAST / 37-139	A (dB)	C (dB)	Z (dB)			
STD Setting	(dB)	(dB)	(dB)			
63 Hz	-0.1	0.0	0.0	0.20	2.0	Pass
125 Hz	-0.1	0.0	0.0		1.5	Pass
250 Hz	-0.1	0.0	0.0		1.5	Pass
500 Hz	0.0	0.0	0.0		1.5	Pass
1000 Hz	0.0	0.0	0.0		1.0	Pass
2000 Hz	0.1	0.1	0.0		2.0	Pass
4000 Hz	0.0	0.0	0.1		3.0	Pass
8000 Hz	0.0	0.0	0.1		5.0	Pass
16000 Hz	0.0	0.0	-0.1		+5, -INF	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / 37-139	REF	UUC (dB)	ERR (dB)			
UUC Weighting	(dB)	(dB)	(dB)			
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0		0.20	Pass
Z	114.00	114.0	0.0		0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
37-139 / A	REF	UUC (dB)	ERR (dB)			
UUC Time Response	(dB)	(dB)	(dB)			
Fast	114.00	114.0	0.0	0.20	0.10	Pass
Slow	114.00	114.0	0.0		0.10	Pass
Lsq	114.00	114.0	0.0		0.10	Pass

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เอกสารไม่ควบคุม

File: 708-51.34-01 Rev.04 Issue date: 5/6/24

Certificate No : 24-SLM-214
Request No : Req-2024-1379

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139	UUC			
STD Setting	(dB)			
Initial	114.0			
Final	114.0			
Deviated	0.0			

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 37-139	REF	UUC (dB)	ERR (dB)			
STD dB	(dB)	(dB)	(dB)			
110.00	130	129.0	0.0	0.30	1.1	Pass
134.00	134	134.0	0.0		1.1	Pass
129.00	129	129.0	0.0		1.1	Pass
124.00	124	124.0	0.0		1.1	Pass
119.00	119	119.0	0.0		1.1	Pass
114.00	114	114.0	0.0		1.1	Pass
109.00	109	109.0	0.0		1.1	Pass
104.00	104	104.0	0.0		1.1	Pass
99.00	99	99.0	0.0		1.1	Pass
94.00	94	93.9	-0.1		1.1	Pass
89.00	89	88.9	-0.1		1.1	Pass
84.00	84	83.9	-0.1		1.1	Pass
79.00	79	78.9	-0.1		1.1	Pass
74.00	74	73.9	-0.1		1.1	Pass
69.00	69	68.9	-0.1		1.1	Pass
64.00	64	63.9	-0.1		1.1	Pass
59.00	59	58.9	-0.1		1.1	Pass
54.00	54	53.9	-0.1		1.1	Pass
49.00	49	49.0	0.0		1.1	Pass
44.00	44	44.0	0.0		1.1	Pass
39.00	39	39.3	0.3		1.1	Pass
34.00	34	34.4	0.4		1.1	Pass

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เอกสารไม่ควบคุม

File: 708-51.34-01 Rev.04 Issue date: 5/6/24

Certificate No : 24-SLM-214
Request No : Req-2024-1379

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A	REF	UUC (dB)	ERR (dB)			
UUC Range	(dB)	(dB)	(dB)			
37-139	43.60	43.7	0.1	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
A / 37-139	Toneburst	Ref	UUC (dB)	ERR (dB)			
UUC Time Response	(ms)	(dB)	(dB)	(dB)			
Fast	200	135.0	135.0	0.0	0.20	1.0	Pass
	2	118.0	117.6	-0.2		+1.0, -2.5	Pass
	0.25	109.0	108.6	-0.4		+1.5, -5.0	Pass
Slow	200	128.6	128.5	-0.1		1.0	Pass
	2	109.0	108.9	-0.1		+1.0, -5.0	Pass
	0.25	100.0	99.8	-0.2		+1.5, -5.0	Pass
SEL	200	129.0	129.0	0.0		1.0	Pass
	2	109.0	109.0	0.0		+1.0, -2.5	Pass
	0.25	100.0	99.8	-0.2		+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / C / 95-142	REF	UUC (dB)	ERR (dB)			
STD Setting	(dB)	(dB)	(dB)			
Complete cycle	137.4	136.7	-0.70	0.20	3.0	Pass
Positive half cycle	136.4	136.2	-0.20		2.0	Pass
Negative half cycle	136.4	136.2	-0.20		2.0	Pass

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the issuing body.
เอกสารไม่ควบคุม

File: 708-51.34-01 Rev.04 Issue date: 5/6/24



Certificate No. : 24-SLM-214

Request No: Req-2024-1379

12. Overload indication

12. Overall indication		13. Overall indication			
EUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit	Result	
FAST / A / 37-139	EUC		(± dB)		
STD Setting	(dB)				
Positive one-half cycle	142.0				
Negative one-half cycle	142.1				
Deviated	-0.1	0.20	1.5	Pass	

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit	Result
PAST / A / 37-139	UUC	(\pm dB)	(\pm dB)	
STD Setting	(dB)			
Initial	138.0			
Final	138.0			
Deviated	0.0	0.10	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 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1 kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Time burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

– Acceptance Limit and Maximum-permitted Uncertainty was IEC 61672-1:2012

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

เอกสารไม่ควบคุม

FM-706-SLM-01 Rev 04 Issue date 5-6-24

Certificate No. 24-SI-M-314

Request No. Bca-2024-1379

Decision Rule for Statements of Conformity

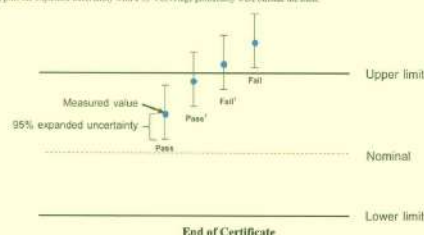
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09:2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements:

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limits

Pass 2 – The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail - The measurement result plus the expanded uncertainty with a 95% coverage probability was outside the limit.



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

เอกสารไม่ควบคุม

E34-708-51 M-011 Free-Debt Limit: 500.74

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Atomic Absorption Spectrometer	CADMIUM IRON LEAD	Agilent Technologies	AA240FS / MY13160001	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	30/1/2025	29/1/2026
2	Atomic Absorption Spectrometer	ARSENIC	Perkin Elmer	PinAAgle 900F / PFB20031902	Perkin Elmer Co.,Ltd.	Preventive Maintenance Report	29/4/2025	28/4/2026
3	Analytical Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XSR205DU / C210685394	National Food Institute, Ministry of Industry, Thailand	2502226-002-01	20/3/2025	19/3/2026
4	Analytical Balance	TOTAL SUSPENDED SOLIDS	Mettler Toledo	XSR205DU / C009071872	National Food Institute, Ministry of Industry, Thailand	2502226-001-01	20/3/2025	19/3/2026
5	Hot Air Oven	TOTAL DISSOLVED SOLIDS TOTAL SUSPENDED SOLIDS	Memmert	UF55 / B212.0411	Technology Promotion Association (Thailand-Japan)	25TM579	19/3/2025	18/3/2026
6	pH Meter	pH	YSI Environmental	pH 100A / JC03354	Technology Promotion Association (Thailand-Japan)	24CH1379	5/11/2024	6/11/2025
7	UV-VIS Spectrophotometer	SULPHATE	Hitachi	U-2900 / 21E22-009	DQE Services Co.,Ltd.	SP25-001	3/1/2025	2/1/2026
8	Turbidity Meter (Portable)	TURBIDITY (NTU)	Oakton Instruments(China)	T100IR / 1120501017	Technology Promotion Association (Thailand-Japan)	24CH1115	6/9/2024	5/9/2025

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

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Atomic Absorption Spectrometer	CADMIUM IRON LEAD	Agilent Technologies	AA240FS / MY13160001	Agilent Technologies (Thailand) Co.,Ltd.	Preventive Maintenance Checklist	30/1/2025	29/1/2026
2	Atomic Absorption Spectrometer	ARSENIC	Perkin Elmer	PinAAcle 900F / PFB20031902	Perkin Elmer Co.,Ltd.	Preventive Maintenance Report	29/4/2025	28/4/2026
3	Analytical Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XSR205DU / C210685394	National Food Institute, Ministry of Industry, Thailand	2502226-002-01	20/3/2025	19/3/2026
4	Analytical Balance	TOTAL SUSPENDED SOLIDS	Mettler Toledo	XSR205DU / C009071872	National Food Institute, Ministry of Industry, Thailand	2502226-001-01	20/3/2025	19/3/2026
5	pH Meter	pH	Horiba	LAQUA-PH210 / HA1L0035	technology promotion association (thailand-japan)	25CH262	28/2/2025	27/2/2026
6	UV-VIS Spectrophotometer	SULPHATE	Hitachi	U-2900 / 21E22-009	DQE Services Co.,Ltd.	SP25-001	3/1/2025	2/1/2026
7	Turbidity Meter (Portable)	TURBIDITY (NTU)	Oakton Instruments(China)	T100IR / 1120501017	Technology Promotion Association (Thailand-Japan)	24CH1115	6/9/2024	5/9/2025

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

Agilent Preventive Maintenance provides factory recommended service for your analytical systems to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak. This checklist will be completed at the end of the service and provided to you as a record of the installation.

Note: While non-current production AA instrument and/or accessory models are not covered specifically in this document it can be used as a basic reference.

For more information about Agilent Technologies services please visit our web site using the following URL <http://www.agilent.com/en-us/services>

Introduction

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

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Location: United Analyst and Engineering Consultant

List System Component Product Numbers	List the Serial Numbers of each Component
1. G 9432 A	M7 13160001
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	

Preparation, Safe operation and Initial performance checks

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- Get answers. Share insights. Build connections: Join the [Agilent Community](https://community.agilent.com/welcome) at <https://community.agilent.com/welcome>

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Confirm the ability of the instrument to deliver continued safe operation as established via the Agilent AA safe operation flow chart. (Refer directly to the AA 55/240/280 Preventive Maintenance Scope of Work to make this decision.)
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page.
- Complete the total number of pages field in the Service Completion section.
- Ask the customer to sign the Service Completion section including the customer's and your signature.

This information is subject to change without notice.

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- Review the instrument logbook for recorded problems and comments.
- Save instrument control settings before starting the procedure.
- Perform a general inspection of the system for cleanliness.
- Check for proper installation of parts, assemblies, sensors etc.
- Check system for required installation of components, settings as defined by current Service Notes
- Check for required firmware updates and verify with customers if they would like them installed.
- Use SVD to perform a Full Wavelength Scan for Cu HCL - "As found test_1"
- Perform a Basic Cu ABS test - "As found test_2"
- Print the Details page or screen captures of the test results and attach to the end of this checklist.

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- ☑ Confirm power supply voltages using the *SVD Power Supply diagnostic*.
- ☑ For Dual Beam instruments - Confirm RBC frequency using the *SVD RBC frequency diagnostic*.

Mechanical components

- ☑ Check the burner adjuster controls for complete and free movement. If the burner adjuster needs lubrication, use Molykote 321 or mineral-based molybdenum disulphide grease.
- ☑ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ☑ Monochromator drive
 - ☑ Slit drive
 - ☑ Lamp selector
 - ☐ ABA

Optics components

- ☑ Check that external optical surfaces are clean – Clean or replace as required.
- ☑ Use SVD and perform *Mono Wavelength Correction*.
- ☑ Use SVD and perform *Slit Calibration*.
- ☑ Use SVD and perform *Grating Squareness Diagnostic*.
- ☑ Use SVD and perform *Zero Order Offset/Mono Correction*.
- ☑ Use SVD and perform *Wavelength Repeatability*.
- ☑ Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gain for each lamp. Advise customer if lamps are showing emission degradation due to age.
- ☑ Check that the signal energy of the D2 and HC lamps track properly. Advise customer if their D2 lamp is showing emission degradation due to age.

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- ☑ Clean the nebulizer, spray chamber and liquid trap.
- ☑ Change all o-rings and seals in the nebulizer, nebulizer block and spray chamber.
- ☑ Check that the pressure relief bung releases readily.
- ☑ Change o-rings on the fuel and oxidant delivery barbs
- ☑ Leave the liquid trap EMPTY and verify the flame will not ignite in this state.
- ☑ Refill liquid trap and check that overflow drains freely into the drain/waste tube.
- ☑ Check the drain/waste tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel
- ☑ Check and clean the igniter electrode

Gas handling components and safety interlocks

- ☑ Pressure test for leaks
- ☑ Leak test gasbox internal components and connections
- ☑ Check safety interlock status and operation using the *SVD Interlock monitoring diagnostic*.

Analytical performance for Flame systems

- ☑ Ignite a flame.
- ☑ Check that you can adjust the nebulizer uptake rate from 4 to 6.5 mL per minute.
- ☑ Optimize the instrument ready to perform Cu sensitivity test.
- ☑ Create a manual method to perform a Basic Cu ABS test - "Final Performance Testing"
- ☑ Run a PM completed sensitivity test for a 5 ppm copper sample and record the results in the AA PM Performance test results and measurements table.

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- ☐ Confirm power supply voltages using the *SVD Power Supply diagnostic*.

Mechanical components

- ☑ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ☐ Monochromator drive
 - ☐ Slit drive
 - ☐ Lamp selector

Optics components

- ☑ Check that external optical surfaces are clean – Clean or replace as required.
- ☑ Use SVD and perform *Mono Wavelength Correction*.
- ☑ Use SVD and perform *Slit Calibration*.
- ☑ Use SVD and perform *Grating Squareness Diagnostic*.
- ☑ Use SVD and perform *Zero Order Offset/Mono Correction*.
- ☑ Use SVD and perform *Wavelength Repeatability*.
- ☑ Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gain for each lamp. Advise customer if lamps are showing emission degradation due to age.

Gas handling, water system and workhead component checks

- ☑ Inspect the GTA workhead gas hoses and connections for leaks.
- ☑ Pressure test for gas leaks
- ☑ If the cooler system is accessible (stand-alone) check for correct operation and coolant/water level – this includes any temperature and pressure settings plus filter cleaning (air flow and water).
- ☑ Inspect the GTA workhead water hoses and connections for leaks.
- ☑ Check all graphite components and replace if necessary.

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- ☑ Run the sensitivity test for a 25 ppb copper sample and record the results in the results table.

PSD autosampler accessory for Furnace systems

- ☑ *Section NOT Applicable*
- ☑ Check condition of the PSD capillary – replace if necessary
- ☑ Check condition and operation of PSD syringe – ensure it does not have air locks and bubbles.
- ☑ Change PSD rinse bottle o-ring.
- ☑ Check and clean the rinse vessel.
- ☑ Check the drain tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel.
- ☑ Ensure that the waste vessel is suitable for use with the furnace system.

Sample introduction pump system (SIPS) accessory

- ☑ *Section NOT Applicable*
- ☑ Re-torque screws securing the hubs, presser arms and pump rotors.
- ☑ Adjust each roller so that it rotates freely.
- ☑ Wipe clean the pump rotor rollers and pump bands with a dry clean cloth.
- ☑ Ensure that the presser arms and the surfaces near the pump are free from dirt and spills.
- ☑ Remove the pump module rear cover and check for the incursion of liquids and any signs of corrosion.
- ☑ Re-torque the nuts that fasten the motor mounting plates to the chassis.
- ☑ Check clips securing the diluents holder and replace if necessary.
- ☑ Disconnect, clean T-piece, and reassemble the tubing using the following steps.

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Sample preparation system (SPS 4) accessory

Section NOT Applicable

The Agilent SPS 4 autosampler is designed to need minimal maintenance.

The following maintenance requirements are suggested to maintain the performance of the autosampler.

- ☐ Cleaning the spill tray, rack location mat, end frames and chassis accessories with a damp soft cloth and diluted mild detergent.
- ☐ Cleaning the autosampler cover panels with domestic window cleaner.
- ☐ Checking the X- axis and Z- axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes..
- ☐ Check the X- axis, Theta- axis and Z- axis FFC cables for cracks, incorrect positioning, damaged edge or damaged connectors.

NOTE: The autosampler requires no extra lubrication throughout its lifetime.

For further details refer to the SPS 4 service manual G8410-90050.

Sample preparation system (SPS 3) accessory

Section NOT Applicable

- ☐ Check the x-axis and z-axis timing belts – Replace if there is any cracks, splits or color deterioration and belt tension.
- ☐ Check belt tensions - adjust if required
- ☐ Check the lubrication pad for single x-axis shaft. If pad is dry or customer has observed any vibration or erratic movements of the x-axis carriage, add 1 mL of Dow Corning 200 @ Fluid, 200 CS into the well.
- ☐ Check the auto-sampler ability to find tube positions - Calibrate if required.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

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- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this service, parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or if necessary, in the customer's IQ records.

Test Results

Test Description	Expected Test Result	Actual Test Result
Flame optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	49 %
Flame performance test with 5 ppm copper sample		
Air /acetylene, mixing paddle removed	Abs value > 0.5	0.5598
Air /acetylene, mixing paddle installed, 10 replicates	%RSD < 1.0	0.2 %
Deuterium furnace optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	-
Deuterium furnace performance test with 25 ppb copper sample (324.8 nm)		
Precision %RSD	≤ 4.0%	-
Abs value	≥ 0.15	-
Zeeman furnace analytical performance: 25 ppb copper sample (327.4 nm)		
Precision %RSD	≤ 4.0%	-
Abs value	≥ 0.10	-
MSR%	≥ 70 %	-

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- ☐ Lubricate gear regulation mechanism to the pad (check for adjustment requirements).

- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

UltrAA lamp accessory (external)

Section NOT Applicable

- ☐ Check the condition of the power cable.
- ☐ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

Restore System

- ☐ If you have altered the customer's instrumentation during the course of PM, restore to the original status to allow the customer to conduct their normal activities (e.g., reload the customer's method.)

Guidance

If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

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Consumable part	Part Number	Part Description	Part Status	Part Location
Organic Kit	9910093500	50 55 140 240 280	PM supplied	Flame
Wire Nebulizer Cleaning	9910024700	50 55 140 240 280	consumable	Flame
Tubing-Capillary Std Nebs	9910024800	50 55 140 240 280	consumable	Flame
Capillary Tube Hivac Neb (3) (organics only)	9910044000	50 55 140 240 280	consumable	Flame
Glass impact beads (5/pk)	9910025700	50 55 140 240 280	consumable	Flame
Teflon impact beads (5/pk): (organics only)	9910053300	50 55 140 240 280	consumable	Flame
Burner cleaning strip (100/pk)	9910053900	50 55 140 240 280	consumable	Flame
Window UV silica – round (right side)	2010082600	50 55 140 240 280	PM supplied	Common
Window UV silica – rectangular (left side)	2010082500	50 55 140 240 280	PM supplied	Common
Pad adhesive window (round)	4910012700	50 55 140 240 280	PM supplied	Common
Pad adhesive window (rectangular)	4910012800	50 55 140 240 280	PM supplied	Common
Electrode kit (1 pr) (D2)	6310003400	GTA120	PM supplied	Furnace
Shroud (D2)	6310003100	GTA120	PM supplied	Furnace
Zeeman electrode kit (1 pr)	6310003500	GTA120	PM supplied	Furnace
Zeeman shroud	6310003600	GTA120	PM supplied	Furnace
O-ring PSD rinse bottle	6910025900	PSD120	PM supplied	Furnace

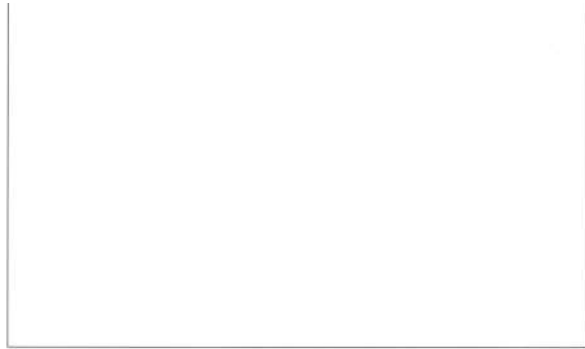
* For engineers who only service AA instruments 5190-8279 can be used as a cheaper alternative for 6610030100.

Items classified as PM supplied in the above table are included in the standard PM. Those classified as consumable should be provided by the customer or charged to the customer if supplied by the Agilent service engineer.

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Service Completion

Service request number 6009549143 Date service completed 30 Jan 2025
Agilent signature Kanyakorn S. Customer signature Samdan Y.
Total number of pages in this document 13

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Power Supply

Averaging Period: 30.0
Datapoint Count: 20

	Lower Limit (V)	Actual (V)	Upper Limit (V)	Result:
12.00 V Rail	10.80	12.12	13.20	Passed
-12.00 V Rail	-13.20	-11.90	-10.80	Passed
5.00 V Rail	4.60	5.04	5.50	Passed
310.00 V Rail	270.00	320.00	341.00	Passed

Report Generated At: 1/30/2025 9:47:25 AM

2

SVD Results Report SVD

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Frame Instrument: True Mono Type: Automatic
Furnace Instrument: True Gasbox Type: Y Gas Box
Zeeman Present: False Auto Burner Adjuster: False
Internal Zeeman: False Mains Frequency: 50
Internal UltraAA: False Firmware Version: 2.11
Optics Type: Double Beam Photomultiplier Type: Normal(900nm)
D2 BG Correction Fitted: True PWB Version: 45
Boot Block Version: 1.09

EEPROM Data:

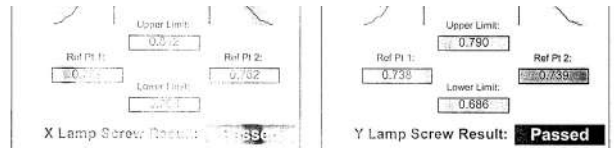
Instrument Run Hours: 68519.180 D2 Run Hours: 63396.500
Zero Wavelength Offset: 00.133 D2 Serial Number: not set I
Mono Correction: 0.770 D2 Install Date: 1/1/1970
Flame Hours: 32411.834 D2 Original Intensity: 1.000
D2 Last Intensity: 475.000

Report Generated At: 1/30/2025 9:47:25 AM

1

SVD Results Report SVD

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Grating S

Lamp Element(s): Copper
Lamp Filament Function: 3
Lamp Current(mA): 4.00
Sds Wavelength(nm): 0.5
1st Order Wavelength(nm): 324.80
Lamp Alignment: 1.1

	Lower Limit (nm)	Actual (nm)	Upper Limit (nm)	Result:
Zero Order	-0.10	0.00	0.10	Passed
First Order	324.45	324.75	325.15	Passed
Second Order	648.90	649.50	649.97	Passed

Report Generated At: 1/30/2025 9:47:25 AM

3

SVD Results Report SVD

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Sample ID: 1004.823
Sample 10: 1004.819
Mean: 1004.823
Standard Deviation: 0.003
Result: **Passed**

Signal Processing Linearity

Calculate Scale: Flow Only Mode

	Lower Limit	Upper Limit	Result:
S1	114	297	Passed
S4	176	181	Passed
S2	271	332	Passed
C2	474	574	Passed
S3	936	1008	Passed
C1	1485	1754	Passed
C3	2108	3053	Passed
S7	4247	5313	Passed

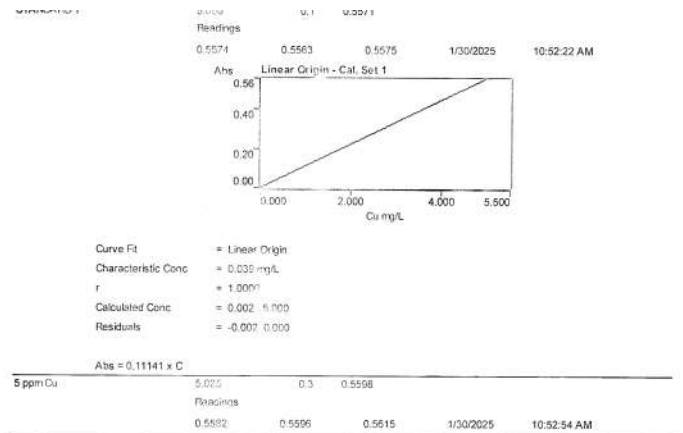
Interlocks:

Oxygen Filter: **Working**
N2O Sensor Filter: **Working**
Flame Shield Closed: **Working**
Gas Control Filter: **Working**
Pressure Release Valve Filter: **Working**
Liquid Trap Filter: **Working**
Flame Detect: **Working**
ECU Active: **Working**
Oxidant Pressure: **Working**
Oxidant Changeover: **Unlabeled**
Ignition: **Working**

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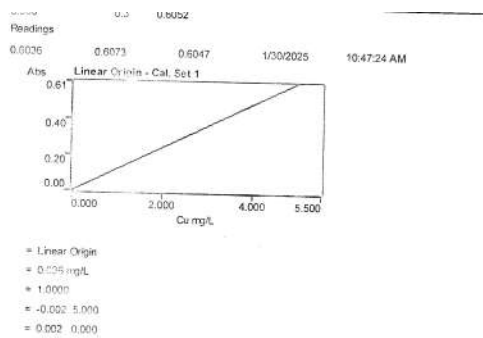
Signatures:
UNIT: _____ Date: 30 Jan 2025
Kanyakorn S.
Kanyakorn S.

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เอกสารไม่ควบคุม

เอกสารไม่ควบคุม



Abs = 0.12105 x C

5 ppm Cu	5.007	0.2	0.0061
Readings:	0.6055	0.6052	0.6047
	0.6055	0.6076	0.6064
			0.6079
			1/30/2025
			10:48:32 AM

เอกสารไม่ควบคุม



เอกสารไม่ควบคุม

PinAAcle 900F Preventive Maintenance Report

Company Name: UAE Consultant Co., LTD.

Instrument Location: 41 Sukumvit Rd.,

Phra Khanong, Bangkok 10260

Instrument Serial No.: PFBS20031902

Date: 29-Apr-2025

เอกสารไม่ควบคุม

Date PM Performed: (DD-MM-YYYY)	29-Apr-2025	Date: (DD-MM-YYYY)	29-Oct-2025
Standard Labor Hours to Complete PM :		5 hours	

Part Number	Release	Publication Date	PerkinElmer®
09370145 Rev.9	A	January 2018	

Scope

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900F by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

General Instructions:

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

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	2
N3160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	1
N9301714	Replacement Acetylene Filter Cartridge	1
TH001022	Replacement Air Filter Cartridge	1

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300183	1000 mg/L Copper Standard	AR	27-39CUIY1	Nov 2025

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 mL	AR	AR
N/A	0.5% HNO ₃	250 mL	AR	AR

เอกสารไม่ควบคุม

2. PL Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary.
- ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☒ Clean exterior of the instrument.
- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification.
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C2H2 and N2O-C2H2 flames (if applicable).

4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary).
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect optics. Clean or replace if necessary.

6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

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N3050109	Ba Lumina HCL	1	061219-020041
N3050139	K Lumina HCL	1	030819-010130
N3050152	Ni Lumina HCL	1	052719-020020

เอกสารไม่ควบคุม

Air Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

B. After PM Performance tests:

8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	0.9668	0.9878	Passed
0.2 A ND Filter	± 5% from Cert.	0.1953	0.1876	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0005	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0001	Passed

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Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0001	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0004	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	N/A	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	N/A	Passed

10. Review:

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

เอกสารไม่ควบคุม

UDI Number				
N/A				
Equipment Location			Bill To Name	
บริษัท อุตสาหกรรม เฟอร์นิเจอร์ จำกัด เลขที่ 51 ถนนสุขุมวิท 51 10260 TH			บริษัท อุตสาหกรรม เฟอร์นิเจอร์ จำกัด เลขที่ 51 ถนนสุขุมวิท 51 10260 TH	
Customer Contact	Phone Number	Fax Number	Email	Purchase Order
K. อุตสาหกรรม เฟอร์นิเจอร์	095-5580049	N/A	nichakorn.praemai1998@gmail.com	HPO-250100002

Work Description		
- PM 202 (AA-BG) (ถ้ามี) - Cleaning Cell, Chamber, Filter - Wavelength Calibrate : Pass - Wavelength Scan As, Cu, Ba, K, Ni : Pass - Align cell with Hg : OK		
Start Date	End Date	Work Description
29/04/2025	09/05/2025	

Tools Used					
Quantity	Calibrated Tool	Description	Serial Number	Last Calibration Date	Next Calibration Date
*** No Calibrated Tools Used ***					

Material Used				
Part Number	Part Description	Note	Lot/Serial Number	Quantity
*** No Parts Used ***				

Labour Details			
Part Number	Part Description	Start Date	Quantity
SV000013	Preventative maintenance	29/04/2025	4

Work Complete		Customer Signature	Technician Signature
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	อ. อุตสาหกรรม เฟอร์นิเจอร์	Chayanon K.
PM/QIPV Left with Customer			
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	9/5/2568 K. อุตสาหกรรม เฟอร์นิเจอร์ (โทรเลข)	9/5/2568 Kanan, Chayanon

Terms & Conditions

เอกสารไม่ควบคุม

Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.

This PinAAcle 900F Passes ☒ Fails ☐ the preventive maintenance.


Review of Preventive Maintenance:

Authorized PerkinElmer Representative:	Date:
Chayanon K.	29 Apr 2025 (DD-MMM-YYYY)
Authorized Customer Representative:	Date:
อ. อุตสาหกรรม เฟอร์นิเจอร์	29 Apr 2025 (DD-MMM-YYYY)

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Date PM Performed: (DD-MMM-YYYY)	29-Apr-2025	Next PM Due Date: (DD-MMM-YYYY)	29-Oct-2025
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Part Number	Release	Publication Date	
09370005	C	January 2013	

Scope

The purpose of this PM is to ensure the continued functionality of the Atomic Absorption/FIAS 100/400 by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

General Instructions:

Always check with the customer before making any changes that may affect the customer's analysis or calibration.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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☒ Is the Working Environment Acceptable? If not, document.

☐ Visual Damage (if yes, describe)

- ☒ Check incoming AC line voltage for proper levels and grounding.
- ☒ Verify Voltage switch on back of instrument is correct
- ☒ Perform general inspection of system for cleanliness. Clean if needed.
- ☒ Gas supply cylinders secured, lines leak checked and argon or nitrogen supply pressure verified (45 – 58 psi).
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Fan checked and filter cleaned
- ☒ Heating mantle or Universal Cell Holder checked

2. Instrument components

- ☒ Non-return valve checked/repared/replaced if needed (B019 8111). Clean the valve if there is any liquid in it. Replace the rubber sleeve (B013 5123) if it is worn. Check the flow meter for any signs of fluid in it. Clean the flow meter if needed.
- ☒ Verify condition of pump pressure adjustment levers (B050 7794 - look for cracks or problems with the springs), pump rollers (B300 0251 check for wear), and thumb screws (B050 7796).
- ☒ Check the Multiport valve for proper switching, flow, and insure there are no leaks. Clean valve parts and replace o-rings if needed (large o-ring: B050 1250, small o-ring: B004 5095). Use a squirt bottle & fishing line to try to dislodge clogs.
- ☒ Firmware Version checked. Latest is 2.20.

3. Mixing/Separation Assembly & Pump Tubing:

- ☒ Mixing separator assembly checked
- ☒ Filter/membrane checked (B050 8306)
- ☒ Condition of the pump tubing (replace if necessary), correct pump tubing for the solutions being run. Make sure the correct magazines are being used. B050 7791 for 0.13 – 1.80 mm tubing; B050 7792 for 1.60 – 3.18 mm tubing.

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Parts Lists

Parts Included with the PM				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
B050 2706	Fan Filter	1	N/A	N/A

Additional Tools Required for PM				
Part Number (if applicable)	Description	Quantity	Serial #	Calibration Due Date (MM/YY)
N/A	Digital Volt Meter	1	N/A	N/A

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	N/A	N/A	N/A	N/A

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

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Review

The preventive maintenance checks and if applicable performance tests for FIAS 100/400 have been completed.	
This FIAS 100/400 Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative: <i>Chayman k.</i>	Date: 29 Apr 2025 (DD-MMM-YYYY)
Authorized Customer Representative: <i>อ. นิชกรณ์</i>	Date: 29 Apr 2025 (DD-MMM-YYYY)

เอกสารไม่ควบคุม

Equipment Location บริษัท อุตสาหกรรม เฟอร์นิเจอร์ จำกัด เลขที่ถนนสุขุมวิท 111/10280 TH		Bill To Name บริษัท อุตสาหกรรม เฟอร์นิเจอร์ จำกัด เลขที่ถนนสุขุมวิท 111/10280 TH	
Customer Contact K. Nitchakorn นิชกรณ์	Phone Number 095-5585043	Fax Number N/A	Email perkinelmer.n42@gmail.com
Purchase Order HPO-34040211			
Work Description - PM 2/2 Warranty - Cleaning Port Valve, Manifold, Tuning - Run Hg test ; Pass			
Start Date 29/04/2025	End Date 29/04/2025	Work Description	
Tools Used			
Quantity	Calibrated Tool	Description	Serial Number
Last Calibration Date			
Next Calibration Date			
*** No Calibrated Tools Used ***			
Material Used			
Part Number	Part Description	Note	Lot/Serial Number
Quantity			
*** No Parts Used ***			
Labour Details			
Part Number	Part Description	Start Date	Quantity
SV00013	Preventative maintenance	29/04/2025	3
SV00002	Service Travel	29/04/2025	1

Work Complete Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		Customer Signature <i>อ. นิชกรณ์</i> 9/52568 K. Nitchakorn นิชกรณ์	Technician Signature <i>Chayman k.</i> 9/52568 Kanon Chayman
PM/OC/PPV Left with Customer Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>			
Terms & Conditions			

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

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

Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 200 nm/min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

เอกสารไม่ควบคุม

Location of calibration : Laboratory 213

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-2900

Serial No. : 21E22-009

ID No. : UAE.WAT.051/2564

Received Date : 3 January 2025

Calibration Date : 3 January 2025

Issue Date : 8 January 2025

Condition Instrument : Good

Calibrated by :

Tanawut Rittidach

(Mr.Tanawut Rittidach)

Technical Manager

Approved by :

Chonchicha Sangngern

(Ms.Chonchicha Sangngern)

Quality Manager

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

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the price written on the certificate.

เอกสารไม่ควบคุม

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5780	0.578	0.0000	0.0031	2.00
	1.0484	1.045	0.0034	0.0029	2.00
	2.1876	2.192	-0.0044	0.0075	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.560	-0.0005	0.0034	2.00
	1.0239	1.023	0.0009	0.0035	2.00
	2.1230	2.125	-0.0020	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.521	0.0020	0.0030	2.00
	0.9633	0.961	0.0023	0.0029	2.00
	1.9753	1.977	-0.0017	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.518	0.0001	0.0031	2.00
	1.0002	0.998	0.0022	0.0033	2.00
	1.9973	1.993	0.0043	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.552	-0.0003	0.0030	2.00
	1.0803	1.079	0.0013	0.0030	2.00
	2.0373	2.032	0.0053	0.0079	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.559	0.0001	0.0031	2.00
	1.0518	1.050	0.0018	0.0030	2.00
	1.9274	1.923	0.0044	0.0079	2.00

เอกสารไม่ควบคุม

235	0.0000	0.000	0.0000	0.0050	2.00
	0.7469	0.744	0.0029	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8674	0.863	0.0044	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2919	0.290	0.0019	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6430	0.640	0.0030	0.0055	2.00

279.45	279.0	0.45	0.18	2.00
287.81	287.3	0.51	0.18	2.00
334.06	333.8	0.26	0.18	2.00
360.93	360.6	0.33	0.18	2.00
418.59	418.2	0.39	0.18	2.00
445.94	445.5	0.44	0.18	2.00
453.66	453.4	0.26	0.18	2.00
460.02	459.8	0.22	0.18	2.00
536.59	536.6	-0.01	0.18	2.00
637.98	637.7	0.28	0.18	2.00
431.38	431.1	0.28	0.18	2.00
472.50	472.3	0.20	0.18	2.00
513.47	513.4	0.07	0.18	2.00
528.88	528.9	-0.02	0.18	2.00
573.17	573.3	-0.13	0.18	2.00
585.35	585.1	0.25	0.20	2.00
684.40	684.5	-0.10	0.18	2.00
740.72	741.0	-0.28	0.20	2.00
748.55	748.8	-0.25	0.18	2.00
807.03	807.3	-0.27	0.18	2.00
879.28	879.6	-0.32	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k.

which for a normal distribution corresponds to a coverage probability of approximately 95%

- End of Certificate -

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

Model : T100IR
Serial No. : 1120501017
ID. No. : UAE.WAT.056/2563
Condition As-Received: Used Item
Received Date : 05 September 2024
Calibration Date : 06 September 2024
Reference : 2409-0177DSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 20) %
Calibration Procedure : In - house method : CP-CH11
Direct measurement by
using Formazin standard solution
Calibrated by : Walalak Sirithean
Approved by : 
Approved Signatory
() Unnopphol Harachai
() Ponpan Paipim
(✓) Salthip Meangmai
Issue Date : 9 September 2024

2. Standard Material : The Formazin suspension has been prepared gravimetric from

Material	Manufacturer	Lot No.	Assay
1) Hexamethylenetetramine	HIMEDIA	0000493947	99.65%
2) Hydrazinium Sulfate	HIMEDIA	0000522014	99.40%

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

Calibration result

Performing five - Formazin suspension standard curve by using 0,20,100,400,800 NTU
Turbidity Meter Serial Number : 1120501017

Standard Formazine suspension (NTU)	UUC* Reading (NTU)	Uncertainty of Measurement (± NTU)	Coverage Factor k
0	0.00	0.0081	2.06
20	20.2	0.39	2.00
100	100	0.75	2.00
400	401	1.5	2.06
800	801	2.1	2.17

Remark - UUC* = Unit Under Calibration
- NTU = Nephelometric Turbidity Units

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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The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Calibration and Testing Equipment Services.

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เอกสารไม่ควบคุม



Certificate of Calibration

Cert.No.: 24CH1379
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : EcoSense
Model : pH100A
Serial No. : JC03354
ID No. : UAE.EFM.063/2562(ENV.pH03/62)
Condition As-Received: Used Item
Received Date : 05 November 2024
Calibration Date : 06 November 2024
Reference : 2411-0122WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

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

Calibrated by : Warakorn Lemgagtrakul

Approved by : 
Approved Signatory

() Unnopphol Harachai
(✓) Ponpan Paipim
() Saithip Meangmai

Issue Date : 8 November 2024

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

Condition of this calibration result

1. Reference Standard Instrument

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

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

2. Certified Reference Materials

The measurement results are traceable to SI through Hach Lenge GmbH Ltd., Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	1034203	27 Sep 2026
pH 6.999	Hach Lenge GmbH	C03145	28 Feb 2026
pH 10.010	CPA chem	1034205	27 Sep 2025

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (± mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: JC03354	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-178	10.01	0.58	2.00

เอกสารไม่ควบคุม



Cert.No.: 24CH1379
Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.:240710SIA605377	4.008	4.01	173	0.0079	2.00
	6.999	7.00	-2	0.0092	2.00
	6.999	7.00	-2	0.0095	2.00
	10.010	10.01	-178	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : -
- Serial No. : 240710SIA605377
Dimension of probe
- Length : 110 mm.
- Diameter : 12 mm.
- Immersion Depth : 100 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
15.0	15.003	14.9	-0.103	0.13	2.00
30.0	30.001	29.9	-0.101	0.13	2.00
45.0	45.003	44.8	-0.203	0.13	2.00

Remark - UUC* = Unit Under Calibration

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

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เอกสารไม่ควบคุม

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UF 55
Serial No. : B212.0411
ID No. : UAE.WAO.005/2556
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 19 March 2025
Calibration Date : 19 March 2025
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Man Pattanapongpaiboon

Approved by : 
() Chakrit Waewwanjua
() Suwit Imjai
(✓) Kunchit Promprat
Issue Date : 27 March 2025

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

Serial No.: C009071872
Capacity: 82 g / 220 g

ID No.: UAE.WAO.012/2563

Date of Calibration: 20 March 2025 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0-80 g

Calibration Adjustment: Internal Calibration

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

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
Unloaded	0.000000	0.00000	0.00000	0.0000089	2.00
0.001	0.001003	0.00100	0.00000	0.0000092	2.00
0.005	0.005002	0.00500	0.00000	0.0000094	2.00
0.01	0.010003	0.01000	0.00000	0.0000091	2.00
0.05	0.049996	0.05000	0.00000	0.0000098	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500016	0.50000	0.00002	0.000014	2.00
1	1.000003	1.00001	-0.00001	0.000016	2.00
2	2.000023	2.00005	-0.00003	0.000017	2.00
5	5.000015	5.00005	-0.00003	0.000021	2.00
10	10.000009	10.00005	-0.00004	0.000026	2.00
20	20.000030	20.00012	-0.00009	0.000037	2.00
30	30.000039	30.00012	-0.00008	0.000050	2.00
50	50.000028	50.00014	-0.00011	0.000068	2.00
80	80.000067	80.00020	-0.00013	0.00011	2.00

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

2008 baesaprasaunsi 35 nuayuanuakunsi koonuabou waknawade ngonnuakunsi 1
2008 Soi 35, Anur Ariyam Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8698 Fax: +66(0) 2422 8545



Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C210685394

ID No.: UAE.WAO.010/2565

Order No.: 2502226

Operation No.: 2502226-002

Date of Receipt: 19 March 2025

Date of Calibration: 20 March 2025

Calibrated by Mr.Yothin Charoensuk
Scientist

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

Date of Issue: 25 March 2025

The uncertainties are for a confidence probability of approximately 95%

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

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

2008 baesaprasaunsi 35 nuayuanuakunsi koonuabou waknawade ngonnuakunsi 1
2008 Soi 35, Anur Ariyam Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8698 Fax: +66(0) 2422 8545



Serial No.: C009071872
Capacity: 82 g / 220 g

ID No.: UAE.WAO.012/2563

Date of Calibration: 20 March 2025 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: >80-200 g

Calibration Adjustment: Internal Calibration

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

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
90	90.00010	90.0002	-0.0001	0.00015	2.00
100	100.00006	100.0001	0.0000	0.00016	2.00
110	110.00007	110.0001	0.0000	0.00017	2.00
120	120.00009	120.0002	-0.0001	0.00018	2.00
130	130.00010	130.0002	-0.0001	0.00019	2.00
140	140.00013	140.0002	-0.0001	0.00019	2.00
150	150.00009	150.0002	-0.0001	0.00021	2.00
160	160.00010	160.0002	-0.0001	0.00022	2.00
170	170.00012	170.0002	-0.0001	0.00023	2.00
200	200.00013	200.0002	-0.0001	0.00028	2.00

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

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

2008 baesaprasaunsi 35 nuayuanuakunsi koonuabou waknawade ngonnuakunsi 1
2008 Soi 35, Anur Ariyam Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8698 Fax: +66(0) 2422 8545



Serial No.: C210685394
Capacity: 82 g / 220 g

ID No.: UAE.WAO.010/2565

Date of Calibration: 20 March 2025 Page 2 of 4

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

Place of Calibration: 208 Balance Room, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

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

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8505567572	TCS	M24041005	19 April 2025
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NF18TH 017/23	Quality Reborn	QB25-0542	10 February 2026

3. This certification is traceable to SI UNIT

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

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

Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.0000042
80	0.0000042
100	0.0000000
200	0.0000000

2. Off-Center Error:

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

The balance reading obtained is given in the table.



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

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

2008 baesaprasaunsi 35 nuayuanuakunsi koonuabou waknawade ngonnuakunsi 1
2008 Soi 35, Anur Ariyam Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10700, Thailand
Tel: +66(0) 2422 8698 Fax: +66(0) 2422 8545



Serial No.: C210685394
Capacity: 82 g / 220 g

ID No.: UAE.WAO.010/2565

Date of Calibration: 20 March 2025

Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0-80 g

Calibration Adjustment: Internal Calibration

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

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
Unloaded	0.000000	0.00000	0.00000	0.0000087	2.00
0.001	0.001003	0.00100	0.00000	0.0000099	2.00
0.005	0.005002	0.00501	-0.00001	0.0000092	2.00
0.01	0.010003	0.01002	-0.00002	0.0000089	2.00
0.05	0.049996	0.05001	-0.00001	0.0000096	2.00
0.1	0.100011	0.10002	-0.00001	0.000011	2.00
0.5	0.500016	0.50004	-0.00002	0.000014	2.00
1	1.000003	1.00005	-0.00005	0.000016	2.00
2	2.000023	2.00006	-0.00004	0.000017	2.00
5	5.000015	5.00006	-0.00005	0.000020	2.00
10	10.000009	10.00005	-0.00004	0.000026	2.00
20	20.000030	20.00007	-0.00004	0.000037	2.00
30	30.000039	30.00009	-0.00005	0.000050	2.00
50	50.000028	50.00008	-0.00005	0.000068	2.00
80	80.000067	80.00013	-0.00006	0.00011	2.00

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

เอกสารไม่ควบคุม



Agilent Preventive Maintenance provides factory recommended service for your analytical systems to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak. This checklist will be completed at the end of the service and provided to you as a record of the installation.

Note: While non-current production AA instrument and/or accessory models are not covered specifically in this document it can be used as a basic reference.

For more information about Agilent Technologies services please visit our web site using the following URL <http://www.agilent.com/en-us/services>

Introduction

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

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Serial No.: C210685394
Capacity: 82 g / 220 g

ID No.: UAE.WAO.010/2565

Date of Calibration: 20 March 2025

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: >80-200 g

Calibration Adjustment: Internal Calibration

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

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
90	90.00010	90.0002	-0.0001	0.00015	2.00
100	100.00006	100.0001	0.0000	0.00016	2.00
110	110.00007	110.0002	-0.0001	0.00017	2.00
120	120.00009	120.0002	-0.0001	0.00018	2.00
130	130.00010	130.0002	-0.0001	0.00019	2.00
140	140.00013	140.0002	-0.0001	0.00019	2.00
150	150.00009	150.0002	-0.0001	0.00021	2.00
160	160.00010	160.0002	-0.0001	0.00022	2.00
170	170.00012	170.0002	-0.0001	0.00023	2.00
200	200.00013	200.0002	-0.0001	0.00028	2.00

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

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Check out the Resource Page here: <https://www.agilent.com/en-us/agilentresources>

- Need technical support, FAQs, supplies? – visit our [Support Home page](http://www.agilent.com/search/support) at <http://www.agilent.com/search/support>
- Get answers. Share insights. Build connections:
Join the [Agilent Community](https://community.agilent.com/welcome) at <https://community.agilent.com/welcome>

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Confirm the ability of the instrument to deliver continued safe operation as established via the Agilent AA safe operation flow chart. (Refer directly to the AA 55/240/280 Preventive Maintenance Scope of Work to make this decision.)
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "Section not applicable" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance service in the order of the tasks listed.
- Complete the Service Review section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Completion section including the customer's and your signature.

This information is subject to change without notice.

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Location United Analyst and Engineering Consultant

List System Component Product Numbers	List the Serial Numbers of each Component
1. <u>G 3432 A</u>	<u>M1 13160001</u>
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	

✓ VERIFY THE INSTRUMENTS, EQUIPMENT AND REQUIRED PRODUCTS AND COMPONENTS:

- ✓ Save instrument control settings before starting the procedure.
- ✓ Perform a general inspection of the system for cleanliness.
- ✓ Check for proper installation of parts, assemblies, sensors etc.
- ✓ Check system for required installation of components, settings as defined by current Service Notes
- ✓ Check for required firmware updates and verify with customers if they would like them installed.
- ✓ Use SVD to perform a Full Wavelength Scan for Cu HCL - "As found test_1"
- ✓ Perform a Basic Cu ABS test - "As found test_2"
- ✓ Print the Details page or screen captures of the test results and attach to the end of this checklist.

Preparation, Safe operation and Initial performance checks

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- ✓ Confirm power supply voltages using the *SVD Power Supply diagnostic*.
- ✓ For Dual Beam Instruments - Confirm RBC frequency using the *SVD RBC frequency diagnostic*.

Mechanical components

- ✓ Check the burner adjuster controls for complete and free movement. If the burner adjuster needs lubrication, use Molykote 321 or mineral-based molybdenum disulphide grease.
- ✓ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ✓ Monochromator drive
 - ✓ Slit drive
 - ✓ Lamp selector
 - ABA

Optics components

- ✓ Check that external optical surfaces are clean – Clean or replace as required.
- ✓ Use SVD and perform *Mono Wavelength Correction*.
- ✓ Use SVD and perform *Slit Calibration*.
- ✓ Use SVD and perform *Grating Squareness Diagnostic*.
- ✓ Use SVD and perform *Zero Order Offset/Mono Correction*.
- ✓ Use SVD and perform *Wavelength Repeatability*.
- ✓ Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gain for each lamp. Advise customer if lamps are showing emission degradation due to age.
- ✓ Check that the signal energy of the D2 and HC lamps track properly. Advise customer if their D2 lamp is showing emission degradation due to age.

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- ✓ Clean the nebulizer, spray chamber and liquid trap.
- ✓ Change all o-rings and seals in the nebulizer, nebulizer block and spray chamber.
- ✓ Check that the pressure relief bung releases readily.
- ✓ Change o-rings on the fuel and oxidant delivery bars.
- ✓ Leave the liquid trap EMPTY and verify the flame will not ignite in this state.
- ✓ Refill liquid trap and check that overflow drains freely into the drain/waste tube.
- ✓ Check the drain/waste tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel
- ✓ Check and clean the igniter electrode

Gas handling components and safety interlocks

- ✓ Pressure test for leaks
- ✓ Leak test gasbox internal components and connections
- ✓ Check safety interlock status and operation using the *SVD interlock monitoring diagnostic*.

Analytical performance for Flame systems

- ✓ Ignite a flame.
- ✓ Check that you can adjust the nebulizer uptake rate from 4 to 6.5 mL per minute.
- ✓ Optimize the instrument ready to perform Cu sensitivity test.
- ✓ Create a manual method to perform a Basic Cu ABS test - "Final Performance Testing"
- ✓ Run a PM completed sensitivity test for a 5 ppm copper sample and record the results in the AA PM Performance test results and measurements table.

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- ❑ Confirm power supply voltages using the *SVD Power Supply diagnostic*.

Mechanical components

- ❑ Run SVD tests to exercise all motor drives over the full range of their travel:
 - ❑ Monochromator drive
 - ❑ Slit drive
 - ❑ Lamp selector

Optics components

- ❑ Check that external optical surfaces are clean – Clean or replace as required.
- ❑ Use SVD and perform *Mono Wavelength Correction*.
- ❑ Use SVD and perform *Slit Calibration*.
- ❑ Use SVD and perform *Grating Squareness Diagnostic*.
- ❑ Use SVD and perform *Zero Order Offset/Mono Correction*.
- ❑ Use SVD and perform *Wavelength Repeatability*.
- ❑ Physically inspect selected HC lamps (customer to supply per their choice) and measure the % Gain for each lamp. Advise customer if lamps are showing emission degradation due to age.

Gas handling, water system and workhead component checks

- ❑ Inspect the GTA workhead gas hoses and connections for leaks.
- ❑ Pressure test for gas leaks
- ❑ If the cooler system is accessible (stand-alone) check for correct operation and coolant/water level – this includes any temperature and pressure settings plus filter cleaning (air flow and water).
- ❑ Inspect the GTA workhead water hoses and connections for leaks.
- ❑ Check all graphite components and replace if necessary.

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Sample preparation system (SPS 4) accessory

Section NOT Applicable

The Agilent SPS 4 autosampler is designed to need minimal maintenance.

The following maintenance requirements are suggested to maintain the performance of the autosampler.

- ❑ Cleaning the spill tray, rack location mat, end frames and chassis accessories with a damp soft cloth and diluted mild detergent.
- ❑ Cleaning the autosampler cover panels with domestic window cleaner.
- ❑ Checking the X- axis and Z- axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes.
- ❑ Check the X- axis, Theta- axis and Z- axis FFC cables for cracks, incorrect positioning, damaged edge or damaged connectors.

NOTE: The autosampler requires no extra lubrication throughout its lifetime.

For further details refer to the SPS 4 service manual G8410-90050.

Sample preparation system (SPS 3) accessory

Section NOT Applicable

- ❑ Check the x-axis and z-axis timing belts – Replace if there is are any cracks, splits or color deterioration and belt tension.
- ❑ Check belt tensions - adjust if required
- ❑ Check the lubrication pad for single x-axis shaft. If pad is dry or customer has observed any vibration or erratic movements of the x-axis carriage, add 1 mL of Dow Corning 200 ⑥ Fluid, 200 CS into the well.
- ❑ Check the auto-sampler ability to find tube positions - Calibrate if required.
- ❑ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

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- ❑ Run the sensitivity test for a 25 ppb copper sample and record the results in the results table.

PSD autosampler accessory for Furnace systems

Section NOT Applicable

- ❑ Check condition of the PSD capillary – replace if necessary
- ❑ Check condition and operation of PSD syringe – ensure it does not have air locks and bubbles.
- ❑ Change PSD rinse bottle o-ring.
- ❑ Check and clean the rinse vessel.
- ❑ Check the drain tube for good drainage. It should not have tight bends, kinks or loops and the lower end must be above the liquid level in the waste vessel.
- ❑ Ensure that the waste vessel is suitable for use with the furnace system.

Sample introduction pump system (SIPS) accessory

Section NOT Applicable

- ❑ Re-torque screws securing the hubs, presser arms and pump rotors.
- ❑ Adjust each roller so that it rotates freely.
- ❑ Wipe clean the pump rotor rollers and pump bands with a dry clean cloth.
- ❑ Ensure that the presser arms and the surfaces near the pump are free from dirt and spills.
- ❑ Remove the pump module rear cover and check for the incursion of liquids and any signs of corrosion.
- ❑ Re-torque the nuts that fasten the motor mounting plates to the chassis.
- ❑ Check clips securing the diluents holder and replace if necessary.
- ❑ Disconnect, clean T-piece, and reassemble the tubing using the following steps.

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- ❑ Check gas regulator pressure to 10 psi (6.9 kPa) – adjust if required.

- ❑ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

UltraAA lamp accessory (external)

Section NOT Applicable

- ❑ Check the condition of the power cable.
- ❑ Clean the exterior surfaces of the accessory with soft lint free cloth. This cloth can be dampened with warm water or a mild detergent. Do not use organic solvents or abrasive cleaning agents.

Restore System

- ❑ If you have altered the customer's instrumentation during the course of PM, restore to the original status to allow the customer to conduct their normal activities (e.g., reload the customer's method.)

Guidance

If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

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- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this service, parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box or if necessary, in the customer's IQ records.

Test Results

Test Description	Expected Test Result	Actual Test Result
Flame optics PMT Gain test:		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	49 %
Flame performance test with 5 ppm copper sample		
Air /acetylene, mixing paddle removed	Abs value > 0.5	0.5599
Air /acetylene, mixing paddle installed, 10 replicates	%RSD < 1.0	0.2 %
Deuterium furnace optics PMT Gain test		
For copper at 324.8 nm, 4 mA, 0.5 nm slit width	< 55 %	-
Deuterium furnace performance test with 25 ppb copper sample (327.4 nm)		
Precision %RSD	≤ 4.0%	-
Abs value	≥ 0.15	-
Zeeman furnace analytical performance: 25 ppb copper sample (327.4 nm)		
Precision %RSD	≤ 4.0%	-
Abs value	≥ 0.10	-
MSR%	≥ 70 %	-

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Service Completion

Service request number: 6007849143 Date service completed: 30 Jan 2025

Agilent signature: Kanyakorn S. Customer signature: David Y.

Total number of pages in this document: 13

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Item / Quantity / Part	Part Number	Part Description	Part Status	Part Name
Organic Kit	9910093500	50 55 140 240 280	PM supplied	Flame
Wire Nebulizer Cleaning	9910024700	50 55 140 240 280	consumable	Flame
Tubing-Capillary Std Nebs	9910024800	50 55 140 240 280	consumable	Flame
Capillary Tube Hvac Neb (3) (organics only)	9910044000	50 55 140 240 280	consumable	Flame
Glass impact beads (5/pk)	9910025700	50 55 140 240 280	consumable	Flame
Teflon impact beads (5/pk) (organics only)	9910053300	50 55 140 240 280	consumable	Flame
Burner cleaning strip (100/pk)	9910053900	50 55 140 240 280	consumable	Flame
Window UV silica - round (right side)	2010082600	50 55 140 240 280	PM supplied	Common
Window UV silica - rectangular (left side)	2010082500	50 55 140 240 280	PM supplied	Common
Pad adhesive window (round)	4910012700	50 55 140 240 280	PM supplied	Common
Pad adhesive window (rectangular)	4910012800	50 55 140 240 280	PM supplied	Common
Electrode kit (1 pr) (D2)	6310003400	GTA120	PM supplied	Furnace
Shroud (D2)	6310003100	GTA120	PM supplied	Furnace
Zeeman electrode kit (1 pr)	6310003500	GTA120	PM supplied	Furnace
Zeeman shroud	6310003600	GTA120	PM supplied	Furnace
O-ring PSD rinse bottle	6910025900	PSD120	PM supplied	Furnace

* For engineers who only service AA instruments 5190-8279 can be used as a cheaper alternative for 6610030100.

Items classified as PM supplied in the above table are included in the standard PM. Those classified as consumable should be provided by the customer or charged to the customer if supplied by the Agilent service engineer.

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Flame Instrument: True Mono Type: Automatic
Furnace Instrument: True Gasbox Type: Y Gas Box
Zeeman Present: False Auto Burner Adjuster: False
Internal Zeeman: False Mains Frequency: 50
Internal UltraAA: False Firmware Version: 2.11
Optics Type: Double Beam Photomultiplier Type: Normal(900nm)
D2 BG Correction Filtered: True PWB Version: 45
Boot Block Version: 1.09

EEPROM Data:

Instrument Run Hours: 69818.180 D2 Run Hours: 53396.500
Zero Wavelength Offset: 00.133 D2 Serial Number: not set
Mono Correction: 0.770 D2 Install Date: 1/1/1970
Flame Hours: 32411.834 D2 Original Intensity: 1.000
D2 Last Intensity: 475.000

Report Generated At: 1/30/2025 9:47:25 AM

1

SVD Results Report SVD



Power Supply

Averaging Period: 30.0
Datapoint Count: 20

	Lower Limit (V)	Actual (V)	Upper Limit (V)	Result:
12.00 V Rail	10.80	12.12	13.20	Passed
-12.00 V Rail	-13.20	-11.90	-10.80	Passed
5.00 V Rail	4.50	5.04	5.50	Passed
310.00 V Rail	270.00	320.00	341.00	Passed

Upper Limit: 0.250
Ref Pt 1: 0.000
Lower Limit: 0.000
Ref Pt 2: 0.752

Upper Limit: 0.790
Ref Pt 1: 0.738
Lower Limit: 0.686
Ref Pt 2: 0.739

X Lamp Screw Result: **Passed**

Y Lamp Screw Result: **Passed**

Grating Spectrometer

Lamp Element(s): Copper
Lamp Filament Position: 3
Lamp Current(mA): 4.00
Slit Width(mm): 0.5
1st Order Wavelength(nm): 324.80
Lamp Alignment: **Passed**

	Lower Limit (nm)	Actual (nm)	Upper Limit (nm)	Result:
Zero Order	-0.10	0.00	0.10	Passed
First Order	324.45	324.75	325.15	Passed
Second Order	648.90	649.50	649.97	Passed

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2

SVD Results Report SVD

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3

SVD Results Report SVD

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Sample 10: 324.819
Mean: 324.820
Standard Deviation: 0.003
Result: **Passed**

Signal Processing Linearity

Calculate Scale: Flow Code Mode

	Lower Limit	Actual	Upper Limit	Result:
S0	114	114	297	Passed
S1	116	114	191	Passed
S2	271	272	332	Passed
S3	574	57	579	Passed
S4	915	91	1008	Passed
S5	1425	149	1754	Passed
S6	2108	2103	3053	Passed
S7	4247	4243	5313	Passed

Interlock:

Oxygen Filtrate: **Working**
 H2O Sensor Filtrate: **Working**
 Flame Shield Closed: **Working**
 Gas Control Filtrate: **Working**
 Pressure Release Filtrate: **Working**
 Liquid Trap Filtrate: **Working**
 Flame Detect: **Working**
 GCU Active: **Working**
 Oxidant Pressure: **Working**
 Oxidant Changeover: **Unlatched**
 Ignition: **Working**

Report Generated At: 1/30/2025 9:47:25 AM

4

SVD Results Report SVD

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Report Generated At: 1/30/2025 9:47:25 AM

5

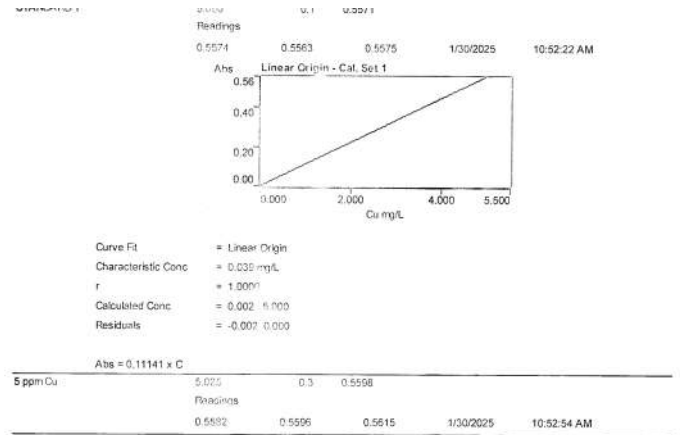
SVD Results Report SVD

เอกสารไม่ควบคุม

Signatures:

Kanyakorn S. 30 Jan 2025

Kanyakorn S. Date



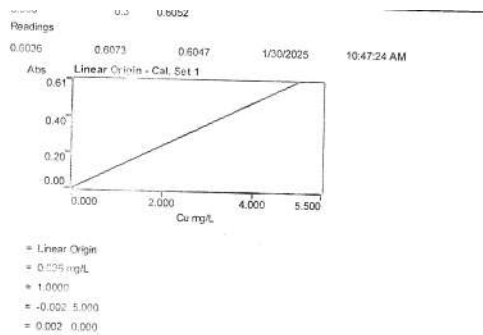
Report Generated At: 1/30/2025 9:47:25 AM

6

SVD Results Report SVD

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Calibration/UL

Sample/QC

Not Assigned

Stoppage

Park

Rescale

Inst Zero

Gain 49 %

Ok

Sensitivity Check 1.5 mg/L gives about 0.2 Abs at 324.8 nm, A/A burner

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

PinAAcle 900F Preventive Maintenance Report

Company Name: UAE Consultant Co., LTD.

Instrument Location: 41 Sukumvit Rd.,

Phra Khanong, Bangkok 10260

Instrument Serial No.: PFB520031902

Date: 29-Apr-2025

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Parts Lists


Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	2
N3160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	1
N9301714	Replacement Acetylene Filter Cartridge	1
TH001022	Replacement Air Filter Cartridge	1

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300183	1000 mg/L Copper Standard	AR	27-39CUY1	Nov 2025

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 mL	AR	AR
N/A	0.5% HNO ₃	250 mL	AR	AR

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Date PM Performed: (DD-MMM-YYYY)	29-Apr-2025	Date: (DD-MMM-YYYY)	29-Oct-2025
Standard Labor Hours to Complete PM :		5 hours	

Part Number	Release	Publication Date	
09370145 Rev.9	A	January 2018	

Scope

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900F by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

General Instructions:

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

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

Update the PM sticker and instrument logbook as required.

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N3050109	Ba Lumina HCL	1	061219-020041
N3050139	K Lumina HCL	1	030819-010130
N3050152	Ni Lumina HCL	1	052719-020020

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4. Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary.
- ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☒ Clean exterior of the instrument.
- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification.
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C2H2 and N2O-C2H2 flames (if applicable).

4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary).
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect optics. Clean or replace if necessary.

6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

Air Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

8. After PM Performance tests:

8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	0.9668	0.9876	Passed
0.2 A ND Filter	± 5% from Cert.	0.1953	0.1876	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0005	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0001	Passed

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Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0001	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0004	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	N/A	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	N/A	Passed

10. Review:

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

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Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.

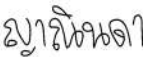

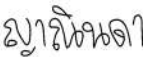

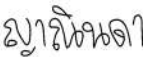

This PinAAcle 900F ☒ Passes ☐ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:	Date: 29 Apr 2025 (DD-MMM-YYYY)
Authorized Customer Representative:	Date: 29 Apr 2025 (DD-MMM-YYYY)

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เอกสารไม่ควบคุม

UDI Number														
N/A														
Equipment Location			Bill To Name											
บริษัท ภูเก็ต แอสเซมบลี จำกัด อาคารพาณิชย์ 10260 TH			บริษัท ภูเก็ต แอสเซมบลี จำกัด อาคารพาณิชย์ 10260 TH											
Customer Contact	Phone Number	Fax Number	Email	Purchase Order										
K. ภูริธรรมา เชนส์ (ไมโคร)	095-5580049	N/A	nichekom.prasamee799@gmail.com	HP-0-250100002										
Work Description														
- PM 2/2 (Manual) - Cleaning Cell, Chamber, Filter - Wavelength Calibrate : Pass - Wavelength Scan As,Cu,Ba,K,NI : Pass - Align cell with Hg. : OK														
Start Date	End Date	Work Description												
28/04/2025	09/05/2025													
Tools Used														
Quantity	Calibrated Tool	Description	Serial Number	Last Calibration Date										
*** No Calibrated Tools Used ***														
Material Used														
Part Number	Part Description	Note	Lot/Serial Number	Quantity										
*** No Parts Used ***														
Labour Details														
Part Number	Part Description	Start Date	Quantity											
51900013	Preventative maintenance	28/04/2025	4											
<table border="1"> <tr> <td>Work Complete</td> <td>Customer Signature</td> <td>Technician Signature</td> </tr> <tr> <td>Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></td> <td rowspan="2">  </td> <td rowspan="2">  </td> </tr> <tr> <td>PMOQ/PMV Left with Customer</td> </tr> <tr> <td>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></td> <td>9/5/2568 K. ภูริธรรมา เชนส์ (ไมโคร)</td> <td>9/5/2568 Kanan, Chayanan</td> </tr> </table>					Work Complete	Customer Signature	Technician Signature	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>			PMOQ/PMV Left with Customer	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	9/5/2568 K. ภูริธรรมา เชนส์ (ไมโคร)	9/5/2568 Kanan, Chayanan
Work Complete	Customer Signature	Technician Signature												
Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>														
PMOQ/PMV Left with Customer														
Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	9/5/2568 K. ภูริธรรมา เชนส์ (ไมโคร)	9/5/2568 Kanan, Chayanan												
Terms & Conditions														

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เอกสารไม่ควบคุม

Date PM Performed: (DD-MMM-YYYY)	29-Apr-2025	Next PM Due Date: (DD-MMM-YYYY)	29-Oct-2025
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Part Number	Release	Publication Date	
09370005	C	January 2013	

Scope

The purpose of this PM is to ensure the continued functionality of the Atomic Absorption/FIAS 100/400 by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

General Instructions:

Always check with the customer before making any changes that may affect the customer's analysis or calibration.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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9/5/2568 WO-03126047

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เอกสารไม่ควบคุม

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Parts Lists

Parts Included with the PM				
Part Number (If applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
B050 2706	Fan Filter	1	N/A	N/A

Additional Tools Required for PM				
Part Number (If applicable)	Description	Quantity	Serial #	Calibration Due Date (MM/YY)
N/A	Digital Volt Meter	1	N/A	N/A

Additional Reagents and Standards Required for PM				
Part Number (If applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	N/A	N/A	N/A	N/A

เอกสารไม่ควบคุม

☐ Visual Damage (if yes, describe)

- ☒ Check incoming AC line voltage for proper levels and grounding.
- ☒ Verify Voltage switch on back of instrument is correct.
- ☒ Perform general inspection of system for cleanliness. Clean if needed.
- ☒ Gas supply cylinders secured, lines leak checked and argon or nitrogen supply pressure verified (45 – 58 psi).
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Fan checked and filter cleaned
- ☒ Heating mantle or Universal Cell Holder checked

2. Instrument components

- ☒ Non-return valve checked/repaired/replaced if needed (B019 8111). Clean the valve if there is any liquid in it. Replace the rubber sleeve (B013 5123) if it is worn. Check the flow meter for any signs of fluid in it. Clean the flow meter if needed.
- ☒ Verify condition of pump pressure adjustment levers (B050 7794 - look for cracks or problems with the springs), pump rollers (B300 0251 check for wear), and thumb screws (B050 7796).
- ☒ Check the Multiport valve for proper switching, flow, and insure there are no leaks. Clean valve parts and replace o-rings if needed (large o-ring: B050 1250, small o-ring: B004 5095). Use a squirt bottle & fishing line to try to dislodge clogs.
- ☒ Firmware Version checked. Latest is 2.20.

3. Mixing/Separation Assembly & Pump Tubing:

- ☒ Mixing separator assembly checked
- ☒ Filter/membrane checked (B050 8306)
- ☒ Condition of the pump tubing (replace if necessary), correct pump tubing for the solutions being run. Make sure the correct magazines are being used. B050 7791 for 0.13 – 1.80 mm tubing; B050 7792 for 1.60 – 3.18 mm tubing.

เอกสารไม่ควบคุม

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

เอกสารไม่ควบคุม

2013

Review

The preventive maintenance checks and if applicable performance tests for FIAS 100/400 have been completed.

This FIAS 100/400 Passes ☒ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:

Chapman K.

Date:

29 Apr 2025
(DD-MMM-YYYY)

Authorized Customer Representative:

สุวิทย์ หงษ์

Date:

29 Apr 2025
(DD-MMM-YYYY)

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Equipment Location					Bill To Name				
K. Nitchakorn Samran					K. Nitchakorn Samran				
K. Nitchakorn Samran 51 10260 TH					K. Nitchakorn Samran 51 10260 TH				
Customer Contact		Phone Number		Fax Number		Email		Purchase Order	
K. Nitchakorn Samran		095-5580043		N/A		penpichai.n42@gmail.com		HPO-240400211	

Work Description		
- PM 272 Warranty - Cleaning Port Valve, Manifold, Tuning - Run Hg test, Pass		
Start Date	End Date	Work Description
29/04/2025	29/04/2025	
29/04/2025	29/04/2025	

Tools Used					
Quantity	Calibrated Tool	Description	Serial Number	Last Calibration Date	Next Calibration Date
*** No Calibrated Tools Used ***					

Material Used					
Part Number	Part Description		Note	Lot/Serial Number	Quantity
*** No Parts Used ***					

Labour Details				
Part Number	Part Description		Start Date	Quantity
SV000013	Preventative maintenance		29/04/2025	3
SV000002	Service Travel		29/04/2025	1

Work Complete		Customer Signature		Technician Signature	
Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>		
PM/QC/PPV Left with Customer		๙๙๙๙๙๙๙๙		Chayman K.	
Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>		
		9/5/2568 K. Nitchakorn Samran		9/5/2568 Kanan, Chayanon	

Terms & Conditions	
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เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Location of calibration : Laboratory 213

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-2900

Serial No. : 21E22-009

ID No. : UAE.WAT.051/2564

Received Date : 3 January 2025

Calibration Date : 3 January 2025

Issue Date : 8 January 2025

Condition Instrument : Good

Calibrated by : ปณิธิ
(Mr. Tanawut Rittidach)
Technical Manager

Approved by : ชณิชา
(Ms. Chonthicha Sangngern)
Quality Manager

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

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written consent of the Laboratory.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

เอกสารไม่ควบคุม

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

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

Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 200 nm/min

Scan Interval of UUC : 0.1 nm.

Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

235	0.0000	0.000	0.0000	0.0050	2.00
	0.7469	0.744	0.0029	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8674	0.863	0.0044	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2919	0.290	0.0019	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6430	0.640	0.0030	0.0055	2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5780	0.578	0.0000	0.0031	2.00
	1.0484	1.045	0.0034	0.0029	2.00
	2.1876	2.192	-0.0044	0.0075	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.560	-0.0005	0.0034	2.00
	1.0239	1.023	0.0009	0.0035	2.00
	2.1230	2.125	-0.0020	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.521	0.0020	0.0030	2.00
	0.9633	0.961	0.0023	0.0029	2.00
	1.9753	1.977	-0.0017	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.518	0.0001	0.0031	2.00
	1.0002	0.998	0.0022	0.0033	2.00
	1.9973	1.993	0.0043	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.552	-0.0003	0.0030	2.00
	1.0803	1.079	0.0013	0.0030	2.00
	2.0373	2.032	0.0053	0.0079	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.559	0.0001	0.0031	2.00
	1.0518	1.050	0.0018	0.0030	2.00
	1.9274	1.923	0.0044	0.0079	2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

279.45	279.0	0.45	0.18	2.00
287.81	287.3	0.51	0.18	2.00
334.06	333.8	0.26	0.18	2.00
360.93	360.6	0.33	0.18	2.00
418.59	418.2	0.39	0.18	2.00
445.94	445.5	0.44	0.18	2.00
453.66	453.4	0.26	0.18	2.00
460.02	459.8	0.22	0.18	2.00
536.59	536.6	-0.01	0.18	2.00
637.98	637.7	0.28	0.18	2.00
431.38	431.1	0.28	0.18	2.00
472.50	472.3	0.20	0.18	2.00
513.47	513.4	0.07	0.18	2.00
528.88	528.9	-0.02	0.18	2.00
573.17	573.3	-0.13	0.18	2.00
585.35	585.1	0.25	0.20	2.00
684.40	684.5	-0.10	0.18	2.00
740.72	741.0	-0.28	0.20	2.00
748.55	748.8	-0.25	0.18	2.00
807.03	807.3	-0.27	0.18	2.00
879.28	879.6	-0.32	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k,

which for a normal distribution corresponds to a coverage probability of approximately 95%

- End of Certificate -

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

Model : T100IR
Serial No. : 1120501017
ID. No. : UAE.WAT.056/2563
Condition As-Received: Used Item
Received Date : 05 September 2024
Calibration Date : 06 September 2024
Reference : 2409-0177DSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 20) %
Calibration Procedure : In - house method : CP-CH11
Direct measurement by
using Formazin standard solution
Calibrated by : Walalak Sirithean
Approved by : 
Approved Signatory
() Unnopphol Harachai
() Ponpan Paipim
(✓) Saithip Meangmai
Issue Date : 9 September 2024

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Calibration and Testing Equipment Services.

เอกสารไม่ควบคุม

2. Standard Material : The Formazin suspension has been prepared gravimetric from

Material	Manufacturer	Lot No.	Assay
1) Hexamethylenetetramine	HIMEDIA	0000493947	99.65%
2) Hydrazinium Sulfate	HIMEDIA	0000522014	99.40%

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

Calibration result

Performing five - Formazin suspension standard curve by using 0,20,100,400,800 NTU
Turbidity Meter Serial Number : 1120501017

Standard Formazine suspension (NTU)	UUC* Reading (NTU)	Uncertainty of Measurement (± NTU)	Coverage Factor k
0	0.00	0.0081	2.06
20	20.2	0.39	2.00
100	100	0.75	2.00
400	401	1.5	2.06
800	801	2.1	2.17

Remark - UUC* = Unit Under Calibration
- NTU = Nephelometric Turbidity Units

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

-o0o-

เอกสารไม่ควบคุม



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



Certificate of Calibration

Cert.No.: 25CH262
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA1L0035
ID No. : UAE.EFM.011/2565(EFM.pH.01/65)
Condition As-Received: Used Item
Received Date : 25 February 2025
Calibration Date : 26 to 28 February 2025
Reference : 2502-0783WSC-2
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard
Calibrated by : Warakorn Lemgagtrakul
Approved by : 
Approved Signatory
() Chakrit Waewwanjua
() Ponpan Paipim
(✓) Saithip Meangmai
Issue Date : 28 February 2025

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม



Cert.No.: 25CH262
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument

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

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

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

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

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (± mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N: HA1L0035	4.00	177.48	177.5	4.01	0.058	2.00
	7.00	0.00	0.1	7.02	0.058	2.00
	7.00	0.00	0.1	7.02	0.058	2.00
	10.00	-177.48	-177.4	10.01	0.329	4.53

เอกสารไม่ควบคุม

Cert.No.: 25CH262
Page.: 3 of 3

for N. nigrocollis

ID No.: UAE.WAQ.010/2565

Capacity: 82 g / 220 g

Date of Calibration: 20 March 2025

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: >80-200 g

Calibration Adjustment: Internal Calibration

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

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
(g)	(g)	(g)	(g)	(* g)	k
90	90.00010	90.0002	-0.0001	0.00015	2.00
100	100.00005	100.0001	0.00006	0.00016	2.00
110	110.00007	110.0002	-0.0001	0.00017	2.00
120	120.00009	120.0002	-0.0001	0.00018	2.00
130	130.00010	130.0002	-0.0001	0.00019	2.00
140	140.00013	140.0002	-0.0001	0.00019	2.00
150	150.00009	150.0002	-0.0001	0.00021	2.00
160	160.00010	160.0002	-0.0001	0.00022	2.00
170	170.00012	170.0002	-0.0001	0.00023	2.00
200	200.00013	200.0002	-0.0001	0.00028	2.00

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

----- End -----

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

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

Oct. 1970, Thailand



10/20

ภาคผนวก ญ

หนังสืออนุญาตขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท ยูไนเต็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด



ที่ อก ๐๓๑๐(๑)/ ๑ ๙ ๙ ๑



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๔ กุมภาพันธ์ ๒๕๖๔

เรื่อง ยกเลิกบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท ยูไนเต็ด แอมนาลีส์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๑๘ กุมภาพันธ์ ๒๕๖๔

ตามคำขอที่อ้างถึง บริษัท ยูไนเต็ด แอมนาลีส์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด
ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๔๔๔ สถานที่ตั้งเลขที่ ๓ ซอยอุดมสุข ๔๑ ถนนสุขุมวิท
แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ขอยกเลิกบุคลากร ความละเอียดแจ้งแล้ว

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้ยกเลิกเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน
จำนวน ๓ ราย ได้แก่

- ๑) นายอภิลักษณ์ ศรีคังแก้ว ทะเบียนเลขที่ ๖-๑๔๔๔-จ-๐๐๔๘
- ๒) นางสาวนันทิศา พรหมกฤษฎา ทะเบียนเลขที่ ๖-๑๔๔๔-จ-๐๑๗๐
- ๓) นายภูวดล เบ้งมา ทะเบียนเลขที่ ๖-๑๔๔๔-จ-๐๑๔๘

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายธีรวัฒน์ อิศรางกูร ณ อยุธยา)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๔๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dlw.mail.go.th

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"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



ที่ อก ๐๓๑๐(๑)/ ๑ ๐ ๘ ๙



กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๐ ๗ กุมภาพันธ์ ๒๕๖๔

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท ยูไนเต็ด แอมนาลีส์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารเคมีของห้องปฏิบัติการวิเคราะห์เอกชน
ลงวันที่ ๓ ธันวาคม ๒๕๖๓

๑. รายชื่อผู้ควบคุมห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๔๐ ราย
๒. รายชื่อเจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑๔๑ ราย
๓. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม

ตามคำขอที่อ้างถึง บริษัท ยูไนเต็ด แอมนาลีส์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด ขอต่ออายุ
หนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๑๔๔๔ สถานที่ตั้งเลขที่ ๓ ซอยอุดมสุข ๔๑
ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท ยูไนเต็ด แอมนาลีส์ แอนด์ เอ็นจิเนียริง
คอนซัลแตนท์ จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

- ก. ผู้ควบคุมห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๔๐ ราย ตามสิ่งที่ส่งมาด้วย ๑
- ข. เจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑๔๑ ราย ตามสิ่งที่ส่งมาด้วย ๒
- ค. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำ/น้ำเสีย น้ำดื่ม อากาศเสีย
สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว และดิน ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๒ กุมภาพันธ์ ๒๕๖๔ หากประสงค์จะต่ออายุหนังสือ
รับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงาน
อุตสาหกรรมภายใน ๖๐ วัน ก่อนวันสิ้นสุดของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายธีรวัฒน์ อิศรางกูร ณ อยุธยา)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมโรงงานอุตสาหกรรม

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กองวิจัยและเตือนภัยมลพิษโรงงาน

กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ

โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕

โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๔๙

ไปรษณีย์อิเล็กทรอนิกส์ saraban@dlw.mail.go.th



"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"



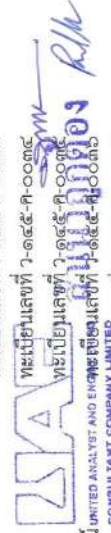
เอกสารแนบท้ายหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท ยูไนเต็ด แอนาไลติกส์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๔๕

ที่ ออ ๐๓๑๐(๑)/ ๑ ๐ ๘ ๙ ลงวันที่ ๐๗ กุมภาพันธ์ ๒๕๖๕

ก. ผู้ควบคุมห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๔๐ ราย

- ๑) นางสาวอุษวรรณ ภัทรธีรกุล ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๐๑
- ๒) นายณรงค์ นิมาลี ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๐๒
- ๓) นางสาวนันทิดา บุญไชย ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๐๓
- ๔) นางปิยะพัชร สุทมนัสวงศ์ ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๐๔
- ๕) นางสาวเบญจวรรณ วิริโยทัย ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๐๖
- ๖) นายพรรัตน์ วงศ์อนุรักษชัย ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๐๗
- ๗) นางสาววิวรรณ บุญลา ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๐๘
- ๘) นายสุวิทย์ จอดนอก ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๐๙
- ๙) นางสาวโชติภา สมบูรณ์ ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๑๐
- ๑๐) นางสาวบุษกร เลิศภาณุมาศ ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๑๑
- ๑๑) นางสาววิไลลักษณ์ ศรีสุข ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๑๒
- ๑๒) นายศิลา บรรจงใจรักษ์ ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๑๔
- ๑๓) นายปฏิกรณ์ คณะนา ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๑๕
- ๑๔) นายธีรวัฒน์ ชมมิ่ง ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๑๖
- ๑๕) นางสาวศิริพร ศรีประดิษฐ์ ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๑๗
- ๑๖) นางสาวสาวิตรี รุ่ง ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๑๘
- ๑๗) นางสาวนพวรรณ อูรารักษ์ ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๑๙
- ๑๘) นายภูษิต พานิชเลิศอาไฟ ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๒๐
- ๑๙) นายธีรวัฒน์ แดงสวัสดิ์ ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๒๑
- ๒๐) นายเอกรัตน์ ปะคามินทร์ ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๒๒
- ๒๑) นางสาวนิศารัตน์ ศรีสกุลสิทธิ์โชค ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๒๓
- ๒๒) นางสาวเจตจิรินทร์ ทังสะอาด ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๒๔
- ๒๓) นางสาวสุวรรณ คงทอง ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๒๕
- ๒๔) นางสาวกรรณ พัฒองขัน ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๒๖
- ๒๕) นายวิรุฬห์ โมกแก้ว ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๒๗
- ๒๖) นายวัชรพงษ์ เทพดนตรี ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๒๘
- ๒๗) นายอนุศาสน์ สายดี ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๒๙
- ๒๘) นายกรวิทย์ เจียรศิริกุล ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๓๐
- ๒๙) นางสาวทศนีย์ อ่อนคำ ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๓๑
- ๓๐) นางพรพรรณ กอนสิน ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๓๒
- ๓๑) นายศุภณัฐ คุณอนากาญจน์ ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๓๓
- ๓๒) นางสาวศิริภาพร เหมอนแร่ ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๓๔
- ๓๓) นางสาวนิส ขันดี ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๓๕
- ๓๔) นางสาวพรณิภา ธีระจินดาชล ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๓๖



- ๓๖) นายนาเคนทร์ พันธุ์วิชาติกุล ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๔๐
- ๓๗) นายกานต์พงศ์ บุญพวง ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๔๑
- ๓๘) นางสาวธรรมา แก้ววชิรนอก ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๔๒
- ๓๙) นางสาวสริน ไทยเชษฐพิพัฒกุล ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๔๓
- ๔๐) นางมาลีดา แยมเปย ทะเบียนเลขที่ ๖-๑๔๕-ค-๐๐๔๔

เอกสารแนบท้ายหนังสือตอบรับชี้แจงระเบียบห้องปฏิบัติการวิเคราะห์เอกชน

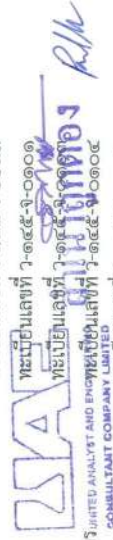
บริษัท ยูไนเต็ด แอนาไลติกส์ แอนด์ เอ็นจิเนียริง คอมซัลแตนท์ จำกัด เลขทะเบียน ๖-๑๕๕-๐๓๑๐(๑) / ๑ ๐ ๘ ๙ ลงวันที่ ๐๗ กุมภาพันธ์ ๒๕๖๕

ข. เจ้าหน้าที่ห้องปฏิบัติการวิเคราะห์เอกชน จำนวน ๑๕๑ ราย

- ๑) นายสุชนันต์ พันสิงห์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๐๑
- ๒) นายพีรณัฐ เจริญผล ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๐๓
- ๓) นางสาววิไลลักษณ์ ไกรสง ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๐๔
- ๔) นายสมชาติ อุหมรัตน์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๐๕
- ๕) นางสาวปรมกรณ ทองแก้ว ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๐๖
- ๖) นางสาวลิยา สมพงษ์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๐๗
- ๗) นางสาวรวี สายบุญเรือน ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๑๐
- ๘) นายกฤษฎพงษ์ นามทิพย์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๑๑
- ๙) นางสาวอรณย์ อ่อนคง ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๑๒
- ๑๐) นายกิตติศักดิ์ พรจรรย์สี ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๑๓
- ๑๑) นางสาวอภิญญา บุญคง ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๑๔
- ๑๒) นางสาวพรพิมล แวนทอง ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๑๕
- ๑๓) นายอภิวิชญ์ ท่วงที ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๑๗
- ๑๔) นายมานิตย์ ปานใจดี ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๑๘
- ๑๕) นายศพร ธนะพุ่มพหุ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๑๙
- ๑๖) นางสาวกัญญาณี โขธา ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๒๐
- ๑๗) นางสาวภาวสี สุทธิ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๒๑
- ๑๘) นางสาวชนมณีย์ อภิพัธย์ภา ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๒๒
- ๑๙) นายสิริพัชร จงคงเกียรติ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๒๓
- ๒๐) นางสาวสุภาวดี อิมาศรี ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๒๔
- ๒๑) นายพงษ์เทพ เหล่าขจร ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๒๕
- ๒๒) นายวิชญ์ชัย พันทุกซ์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๒๖
- ๒๓) นางสาวพัชริศา คดีพิศาล ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๒๗
- ๒๔) นางสาวเมกวิกา เสือคำจันทร์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๒๘
- ๒๕) นายพีรพัฒน์ บัญญัติศิลป์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๒๙
- ๒๖) นายพัชร์วาลย์ เสือหล่อ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๓๐
- ๒๗) นายณภสินธุ์ อนุธรรมรัตน์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๓๑
- ๒๘) นายกันนิกร ระโส ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๓๒
- ๒๙) นายปริญญา กลมเกลียว ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๓๓
- ๓๐) นายธีรวัจน์ มาตรโพธิ์ศรี ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๓๔
- ๓๑) นายบุญฤทธิชัย ก้อนสิน ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๓๕
- ๓๒) นายพรพรวุฒิ ไกรสกุล ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๓๖
- ๓๓) นายชิตะ แสงจันทร์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๓๗
- ๓๔) ว่าที่ร้อยตรีณัฐพงศ์ เมืองชัย ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๓๘
- ๓๕) นายอนันท์ เลิศประเสริฐ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๓๙



- ๓๖) นางสาวนิภาพร จันทเขตต์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๔๗
- ๓๗) นายรณภพ กุฎระกุลพัฒนา ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๔๘
- ๓๘) นายสมพงษ์ สกลไทย ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๔๙
- ๓๙) นายสุวิทย์ นิธิติตัญญ์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๕๐
- ๔๐) นายอัญญาช วนศิริ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๕๑
- ๔๑) นายเอกวุฒิ แสนใจ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๕๒
- ๔๒) นายสุชนันต์ บุญเลี้ยง ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๕๓
- ๔๓) นายธนาเดช หวานสมณะ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๕๔
- ๔๔) นายอภิสิทธิ์ ศรีคงแก้ว ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๕๕
- ๔๕) ว่าที่ร้อยตรีจุฑา แก้ววานิช ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๕๖
- ๔๖) นางสาวมากรินทร์ สามนท์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๕๗
- ๔๗) นายศุภกร รินวงศ์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๕๘
- ๔๘) นางสาวจินตสุภา เปี่ยมศรี ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๕๙
- ๔๙) นางสาวนรนาถ กมลบูรณ์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๖๐
- ๕๐) นางสาวอารียา พราหมณ์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๖๑
- ๕๑) นายจิรวัฒน์ สุขเกษม ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๖๒
- ๕๒) นายกิตติพงษ์ สอนชัยภูมิ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๖๓
- ๕๓) นายจุฑาพล สวณพพร ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๖๔
- ๕๔) นางสาวพัชรภรณ์ แสงฟ้า ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๖๕
- ๕๕) นายรัตนชัย เหล่ามา ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๖๖
- ๕๖) นายอิทธิพงษ์ ศรีเดช ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๖๗
- ๕๗) นางสาวกรณิการ์ ลำสีหา ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๖๘
- ๕๘) นางสาวณัฐชา พรหมศิริ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๖๙
- ๕๙) นายณภสินธุ์ ศรีพิมพ์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๗๐
- ๖๐) นางสาวลักขณา จันทรสขุ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๗๑
- ๖๑) นายศักดิ์สินต์ บุญมี ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๗๒
- ๖๒) นายวรพงษ์ นนทจันทร์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๗๓
- ๖๓) นางสาวนภาภา มาคะมาตร์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๗๔
- ๖๔) นายณัฐชัย พรหมอารักษ์ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๗๕
- ๖๕) นายชินนทร์ พานแก้ว ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๗๖
- ๖๖) นายปรัชญาพล โสภา ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๗๗
- ๖๗) นายวัชรินทร์ แสนงาม ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๗๘
- ๖๘) นายอาทิตย์ อุดมผล ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๗๙
- ๖๙) นายอิทธิเดช ใบบุญ ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๘๐
- ๗๐) นายดิศราณพพร ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๘๑
- ๗๑) นายเสฏฐวุฒิ เอมกลิ่นบัว ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๘๒
- ๗๒) นางสาวนาตาชา แหวงในเมือง ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๘๓
- ๗๓) นางสาวพิมลวรรณ สิมมา ทะเบียนเลขที่ ๖-๑๕๕-๖-๐๐๘๔



๓๔) นายณัฏฐวัฒน์ วงศ์คำ
 ๓๕) นายประสิทธิ์พัทธ์ เฝือกนาง
 ๓๖) นางสาวศุภิสรา ลาจิต
 ๓๗) นางสาวภาพร ชื่นมุกข์
 ๓๘) นางสาวเบญญา มอญคุณ
 ๓๙) นายอมรพล อมรสิทธิ์
 ๔๐) นางสาวศรีเพชร ทองขาว
 ๔๑) นางสาวฉวีกร ศุภชาติกรสร
 ๔๒) นางสาววิมลวรรณ คำตัน
 ๔๓) นายศุภานนท์ ฤทธคณานนท์
 ๔๔) นายบุญรงค์ อ้ายลอย
 ๔๕) นางสาวจิตติมาศ ศรีวรรณ
 ๔๖) นายสุจิต โปพันธ์เงิน
 ๔๗) นายเจษฎา ช่วยศรี
 ๔๘) นายชุต เหมจุลิน
 ๔๙) นายสุโชค หล้าไท
 ๕๐) นายชัย บัวสด
 ๕๑) นางสาวธยา ประสานศรี
 ๕๒) นายพดล เมียมมัย
 ๕๓) นายคุณกร สวนศรี
 ๕๔) นายอดพล ศิลานนท์
 ๕๕) นายยศัย พุ่มสว
 ๕๖) นายธีรวัฒน์ ธรรมสุวรรณ
 ๕๗) นายธีรพงศ์ ชะขุนทด
 ๕๘) นางสาวณัฏฐตา พลนิกรกิจ
 ๕๙) นางสาวณัฏฐา ทองบุรินทร์
 ๖๐) นางสาวพริตตา จรณัติยุทธ
 ๖๑) นางสาวเพ็ญพิชชา รอดทอง
 ๖๒) นางสาวณัฏฐา แสงสว่าง
 ๖๓) นายกิตติ ลืออาจ
 ๖๔) นายธนุพร คงศรี
 ๖๕) นางสาวสุกัลลา เอี่ยมเงิน
 ๖๖) นางสาวพรรณทิพา อะโนนัม
 ๖๗) นายอนันต์ บุค
 ๖๘) นางสาวพรพิมล ประชาพันธ์
 ๖๙) นายวิมลพร บุญยฤทธิ์
 ๗๐) นางสาวณัฐชา แก้วภาพ
 ๗๑) นายสิทธิพล พร้อมพ้อชัยบุญ
 ๗๒) นางสาวนันทิชา กลิ่นหนู

๑๑๓) นางสาวปิทยา...

๑๑๓) นางสาวปิทยา ชูจิตเชื้อ
 ๑๑๔) นางสาวลัดดาวัลย์ โพธิ์พันธ์
 ๑๑๕) นายอาทิตย์ ตาภา
 ๑๑๖) นางสาวบุญภาพร บุญอมศรี
 ๑๑๗) นางสาวพัชรวรรณ จันจิตร
 ๑๑๘) นางสาวนฤกร ไก่บ้านกาย
 ๑๑๙) นางสาวปวีณา แคนชนบ
 ๑๒๐) นางสาวนันทิดา พรหมเกย์
 ๑๒๑) นางสาวกมลชนก ปุณคำ
 ๑๒๒) นางสาวปาริฉัตร ทองใบ
 ๑๒๓) นายชัยวัฒน์ จันละคร
 ๑๒๔) นางสาวกัญญา สิงห์แก้ว
 ๑๒๕) นางสาวอริยา มะดีเภา
 ๑๒๖) นายฐานกรณ์ อนุรา
 ๑๒๗) นางสาวชามันดา กิมาคม
 ๑๒๘) นายธนบดีนทร์ ยาเหลี่ยม
 ๑๒๙) นายธีรพงษ์ แสงท่ง
 ๑๓๐) นางสาวปิยะธิดา ส้านภาพษ์
 ๑๓๑) นางสาวนัสสร ศรีสถาน
 ๑๓๒) นางสาวจรรย์รัตน์ โสแทน
 ๑๓๓) นายธีรวัฒน์ พรหมเสา
 ๑๓๔) นายธนวิทย์ ปลั่งกลาง
 ๑๓๕) นายณภัทร เตมียบุตร
 ๑๓๖) นางสาวจิตภา ภาษา
 ๑๓๗) นางสาวสมณฑาทิพย์ สังข์ทอง
 ๑๓๘) นางสาวชรัส บาบุญ
 ๑๓๙) นายภูวดล เป้งมา
 ๑๔๐) ว่าที่ร้อยตรีณยศ ประทุมเขตต์
 ๑๔๑) นายอนุสร พลสำโรง

งานนี้

เอกสารแนบท้ายหนังสือขอรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

บริษัท ยูไนเต็ด แอแนลิสต์ แอนด์ เอ็นจิเนียริง คอนซัลแตนท์ จำกัด เลขทะเบียน ๑-๑๔๔

ที่ ออ ๐๓๐๐(๑) / ๓ ๐ ๘ ๙ ลงวันที่ ๐๗ กุมภาพันธ์ ๒๕๖๘

ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๓๕๓ รายการ

นับ/แก้ไข จำนวน 46 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
2	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
3	Barium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
4	α-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
5	β-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
6	δ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
7	γ-BHC	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method ⁽⁴⁾ 2) 5-Day BOD Test, Membrane Electrode Method ⁽⁴⁾
9	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
10	Chemical Oxygen Demand	1) Closed Reflux, Titrimetric Method ⁽⁴⁾ 2) Closed Reflux, Colorimetric Method ⁽⁴⁾ 3) Open Reflux, Titrimetric Method ⁽⁴⁾
11	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
12	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
13	Color	ADMI Weighted-Ordinate Spectrophotometric Method ⁽⁴⁾
14	Copper	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
15	Cyanide	1) Distillation, Colorimetric Method ⁽⁴⁾ 2) Total Cyanide after Distillation, by Flow Injection Analysis Method ⁽⁴⁾
16	o,p'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
17	4,4'-DDD	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
18	4,4'-DDE	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
19	4,4'-DDT	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
20	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
21	Endosulfan I	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
22	Endosulfan II	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
23	Endosulfan sulfate	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
24	Endrin	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾

25 Endrin aldehyde...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
25	Endrin aldehyde	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
26	Formaldehyde	Distillation, Colorimetric Method ⁽²⁾
27	Free Chlorine	1) Iodometric Method ⁽⁴⁾ 2) DPD Ferrous Titrimetric Method ⁽⁴⁾
28	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
29	Heptachlor Epoxide	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
30	Hexavalent Chromium	Colorimetric Method ⁽⁴⁾
31	Lead	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
32	Manganese	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
33	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾
34	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
35	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
36	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method ⁽⁴⁾ 2) Soxhlet Extraction Method ⁽⁴⁾
37	pH	Electrometric Method ⁽⁴⁾
38	Phenols	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Distillation, Direct Photometric Method ⁽⁴⁾
39	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
40	Sulfide	1) Iodometric Method ⁽⁴⁾ 2) Methylene Blue Method ⁽⁴⁾
41	Temperature	Laboratory and Field Methods ⁽⁴⁾
42	Total Dissolved Solids	Dried at 180 °C ⁽⁴⁾
43	Total Kjeldahl Nitrogen	Semi-Micro-Kjeldahl Method ⁽⁴⁾
44	Total Suspended Solids	Dried from 103 to 105 °C ⁽⁴⁾
45	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method, Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method, Calculation ⁽⁴⁾
46	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

น้ำได้ดื่ม...

น้ำดื่ม จำนวน 126 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Acenaphthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
2	Acetone	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
3	Aldrin	2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
4	Anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
5	Antimony	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾
6	Arsenic	2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
7	Atrazine	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾
8	Barium	2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
9	Benz(a)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
10	Benzene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
11	Benzo(b)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
12	Benzo(k)fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
13	Benzoic acid	1) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

14

14 Benzo(a)pyrene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
14	Benzo(a)pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
15	Benzo(g,h,i)perylene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
16	Beryllium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
17	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
18	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
19	Bromodichloromethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
20	Bromoform	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
21	Butanol	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
22	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
23	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ⁽⁴⁾
24	Carbazole	3) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
25	Carbon disulfide	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
26	Carbon tetrachloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
27	Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
28	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

29

29 Chlorobenzene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
29	Chlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
30	Chlorodibromomethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
31	Chloroform	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
32	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
33	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ^(a) 2) Digestion, Inductively Coupled Plasma Method ^(a)
34	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation ^(a) 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ^(a)
35	Chromium (VI)	Colorimetric Method ^(a)
36	Chrysene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
37	Cyanide	Distillation, Colorimetric Method ^(a)
38	2,4-D	Liquid-Liquid Extraction, Gas Chromatographic Method ^(a)
39	DDD	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
40	DDE	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
41	DDT	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
42	Dibenz(a,h)anthracene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)

43 Di-n-butyl phthalate...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
43	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
44	1,2-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
45	1,3-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
46	1,4-Dichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
47	3,3'-Dichlorobenzidine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
48	1,1-Dichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
49	1,2-Dichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
50	1,1-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
51	cis-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
52	trans-1,2-Dichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
53	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
54	1,2-Dichloropropane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
55	1,3-Dichloropropane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
56	1,3-Dichloropropene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
57	Dieldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
58	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
59	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
60	2,4-Dinitrophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)

61 2,4-Dinitrotoluene...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
61	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
62	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
63	Di-n-Octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
64	Endosulfan	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
65	Endrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
66	Ethylbenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
67	Fluoranthene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
68	Fluorene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
69	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
70	Heptachlor epoxide	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
71	Hexachlorobenzene	1) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
72	Hexachloro-1,3-butadiene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
73	n-Hexane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)

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ลำดับ	สารมลพิษ	วิธีวิเคราะห์
74	α -HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
75	β -HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
76	γ -HCH	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
77	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
78	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
79	Indeno(1,2,3-cd)pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
80	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
81	Lead	1) Digestion, Direct Air-Acetylene Flame Method ^(a) 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method ^(a)
82	Manganese	3) Digestion, Inductively Coupled Plasma Method ^(a) 1) Digestion, Direct Air-Acetylene Flame Method ^(a) 2) Digestion, Inductively Coupled Plasma Method ^(a)
83	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(a)
84	Methanol	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)
85	Methoxychlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method ^(a) 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(a)
86	Methyl bromide	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ^(a)

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ลำดับ	สารมลพิษ	วิธีวิเคราะห์
87	Methylene chloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
88	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
89	2-Methylnaphthalene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
90	Methyl tert-butyl ether	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
91	Naphthalene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
92	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
93	Nitrobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
94	N-Nitrosodiphenylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
95	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
96	Polychlorinated Biphenyls - PCB 1016 - PCB 1221 - PCB 1232 - PCB-1242 - PCB-1248 - PCB-1254 - PCB-1260	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
97	Pentachlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
98	pH	Electrometric Method ⁽⁴⁾
99	Phenanthrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
100	Phenol	1) Distillation, Chloroform Extraction Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
101	Pyrene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
102	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
103	Silver	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
104	Styrene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
105	1,1,2,2-Tetrachloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
106	Tetrachloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
107	Toluene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
108	Toxaphene	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
109	TPH (C ₅ - C ₈)	1) Purge and Trap, Gas Chromatographic Method ^(12,22) 2) Purge and Trap, Gas Chromatographic/Mass spectrometric Method ^(12,27)
110	TPH (C ₉ - C ₁₆)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(9,22)
111	TPH (C ₁₆ - C ₃₅)	Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(9,22)
112	1,2,4-Trichlorobenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
113	1,1,1-Trichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
114	1,1,2-Trichloroethane	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
115	Trichloroethylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

ลำดับ	สารเคมี	วิธีวิเคราะห์
116	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
117	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
118	1,3,5-Trimethylbenzene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
119	Vanadium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
120	Vinyl acetate	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
121	Vinyl chloride	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
122	m-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
123	o-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
124	p-Xylene	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
125	Xylene (Total)	Purge and Trap Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
126	Zinc	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

ออกาศเสีย (ปล่อยระบาย) จำนวน 25 รายการ

ลำดับ	สารเคมี	วิธีวิเคราะห์
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
2	Arsenic	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
3	Cadmium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
4	Carbon Monoxide	Instrumental Analyzer Method ⁽⁵⁾
5	Chlorine	Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
6	Chromium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽⁵⁾

Chromium (ต่อ)...

ลำดับ	สารเคมี	วิธีวิเคราะห์
6	Chromium (ต่อ)	2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
7	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
8	Copper	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
9	Cresol	Absorption Sampling, Gas Chromatographic Method ⁽⁵⁾
10	Dioxins/Furans	Isokinetic Sampling ⁽⁵⁾
11	Hydrogen Chloride	Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
12	Hydrogen Fluoride	Isokinetic Sampling, Ion Chromatographic Method ⁽⁵⁾
13	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ⁽⁵⁾
14	Lead	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
15	Manganese	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
16	Mercury	Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁵⁾
17	Nickel	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
18	Opacity	Ringelmann's Method ⁽¹⁾
19	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic acid Method ⁽⁵⁾ 2) Instrumental Analyzer Method ⁽⁵⁾
20	Selenium	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁵⁾ 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ⁽⁵⁾
21	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ⁽⁵⁾ 2) Instrumental Analyzer Method ⁽⁵⁾
22	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ⁽⁵⁾

23 Total Suspended Particulate...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
23	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[5]
24	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
25	Xylene	1) Bag Sampling, Gas Chromatographic Method ^[5] 2) Adsorption Sampling, Gas Chromatographic Method ^[5]

สิ่งบ่งชี้มลพิษที่วัดได้ตั้งแต่จำนวน 35 รายการ

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[3,9,23] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[10,23]
2	Antimony	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,6,14] 2) Digestion, Inductively Coupled Plasma Method ^[7,14]
3	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[3,6,16] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,6,14] 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[7,16] 4) Digestion, Inductively Coupled Plasma Method ^[7,14]
4	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,6,14] 2) Digestion, Inductively Coupled Plasma Method ^[7,14]
5	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,6,14] 2) Digestion, Inductively Coupled Plasma Method ^[7,14]
6	Cadmium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[3,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,6,14] 3) Digestion, Inductively Coupled Plasma Method ^[7,14]
7	Chlordane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[3,9,23] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[10,23]

ตาม

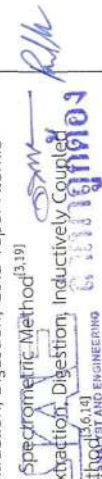
8 Chromium...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
8	Chromium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[3,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,6,14] 3) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 4) Digestion, Inductively Coupled Plasma Method ^[7,14]
9	Chromium (III)	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation ^[3,6,15,17] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation ^[3,6,14,17] 3) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^[7,8,15,17] 4) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^[7,8,14,17]
10	Chromium (VI)	1) Waste Extraction, Colorimetric Method ^[3,17] 2) Alkaline Digestion, Colorimetric Method ^[8,17]
11	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,6,14]
12	Copper	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^[3,6,15] 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[3,6,14] 3) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 4) Digestion, Inductively Coupled Plasma Method ^[7,14]
13	2,4-D	1) Waste Extraction, Gas Chromatographic Method ^[3,26] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[10,23]
14	DDD	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^[3,9,23] 2) Ultrasonic Extraction, Gas Chromatographic Method ^[10,23]

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15 DDE...

ลำดับ	สารเคมี	วิธีวิเคราะห์
15	DDE	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.9.23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10.23)
16	DDT	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.9.23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10.23)
17	Dieldrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.9.23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10.23)
18	Endrin	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.9.23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10.23)
19	Heptachlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.9.23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10.23)
20	Lead	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(3.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.6.14) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7.15) 4) Digestion, Inductively Coupled Plasma Method ^(7.14)
21	Lindane	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.9.23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10.23)
22	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(3.19) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.6.14) 3) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁹⁾ 4) Digestion, Inductively Coupled Plasma Method ^(7.14)


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Mercury (ตะ)

ลำดับ	สารเคมี	วิธีวิเคราะห์
22	Mercury (ตะ)	5) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽²⁰⁾
23	Methoxychlor	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.9.23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10.23)
24	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.6.14) 2) Digestion, Inductively Coupled Plasma Method ^(7.14)
25	Nickel	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(3.6.15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3.6.14) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7.15) 4) Digestion, Inductively Coupled Plasma Method ^(7.14)
26	Polychlorinated Biphenyls - Aroclor 1016 - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5'-Trichlorobiphenyl - 2,4',5'-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'-Pentachlorobiphenyl - 2,2',4,5,5'-Pentachlorobiphenyl - 2,3,3',4,6'-Pentachlorobiphenyl	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3.9.23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10.24)


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Polychlorinated Biphenyls(ตะ)

ลำดับ	สารเคมี	วิธีวิเคราะห์
27	Polychlorinated Biphenyls(ตอ) - 2,2',3,4,4',5'- Hexachlorobiphenyl - 2,2',3,4,5,5'- Hexachlorobiphenyl - 2,2',3,5,5',6'- Hexachlorobiphenyl - 2,2',4,4',5,5'- Hexachlorobiphenyl - 2,2',3,3',4,4',5'- Heptachlorobiphenyl - 2,2',3,4,4',5,5'- Heptachlorobiphenyl - 2,2',3,4,4',5',6'- Heptachlorobiphenyl - 2,2',3,4',5,5',6'- Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6'- Nonachlorobiphenyl Pentachlorophenol	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^(3,9,28) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) Electrometric Method ^(31,32) 1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(3,6,21) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 3) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,21) 4) Digestion, Inductively Coupled Plasma Method ^(7,14) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)
28	pH	
29	Selenium	
30	Silver	
31	Thallium	

32 Toxaphene...

ลำดับ	สารเคมี	วิธีวิเคราะห์
32	Toxaphene	1) Waste Extraction, Separatory Funnel Liquid-Liquid Extraction, Gas Chromatographic Method ^(3,9,23) 2) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 1) Waste Extraction, Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(3,12,27) 2) Waste Extraction, Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(3,11,27) 3) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 4) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27) 1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 2) Digestion, Inductively Coupled Plasma Method ^(7,14) 1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method ^(3,6,15) 2) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(3,6,14) 3) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,15) 4) Digestion, Inductively Coupled Plasma Method ^(7,14)
34	Vanadium	
35	Zinc	

ดิน จำนวน 125 รายการ

ลำดับ	สารเคมี	วิธีวิเคราะห์
1	Acenaphthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) 1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25)
2	Acetone	
3	Aldrin	
4	Anthracene	

Anthracene (ตอ)...

ลำดับ	สารเคมี	วิธีวิเคราะห์
4	Anthracene (๓๖)	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
5	Antimony	Digestion, Inductively Coupled Plasma Method ^(7,14)
6	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,14)
7	Atrazine	2) Digestion, Inductively Coupled Plasma Method ^(7,14)
8	Barium	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
9	Benz(a)anthracene	Digestion, Inductively Coupled Plasma Method ^(7,14)
10	Benzene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25)
11	Benzo(b)fluoranthene	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
12	Benzo(k)fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25)
13	Benzoic acid	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
14	Benzo(a)pyrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
15	Benzo(g,h,i)perylene	1) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,25)
16	Beryllium	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)

17 Bis(2-chloroethyl)ether...

ลำดับ	สารเคมี	วิธีวิเคราะห์
17	Bis(2-chloroethyl)ether	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
18	Bis(2-ethylhexyl)phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
19	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
20	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
21	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
22	Butyl benzyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
23	Cadmium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,15)
24	Carbazole	2) Digestion, Inductively Coupled Plasma Method ^(7,14)
25	Carbon disulfide	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
26	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
27	Chlordane	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
28	p-Chloroaniline	2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
29	Chlorobenzene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
30	Chlorodibromomethane	1) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,23)
31	Chloroform	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
32	2-Chlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)

33 Chromium...

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
33	Chromium	1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,15) 2) Digestion, Inductively Coupled Plasma Method ^(7,16)
34	Chromium (III)	1) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,15,17) 2) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation ^(7,8,14,17) Alkaline Digestion, Colorimetric Method ^(8,17)
35	Chromium (VI)	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
36	Chrysene	Extraction, Distillation, Colorimetric Method ^(29,30) Ultrasonic Extraction, Gas Chromatographic Method ⁽²⁶⁾
37	Cyanide	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
38	2,4-D	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
39	DDD	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
40	DDE	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
41	DDT	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
42	Dibenz(a,h)anthracene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
43	Di-n-butyl phthalate	1) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
44	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
45	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
46	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
47	3,3'-Dichlorobenzidine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
48	1,1-Dichloroethane	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
49	1,2-Dichloroethane	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
50	1,1-Dichloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
51	cis-1,2-Dichloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
52	trans-1,2-Dichloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
53	2,4-Dichlorophenol	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
54	1,2-Dichloropropane	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
55	1,3-Dichloropropane	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
56	1,3-Dichloropropene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
57	Dieldrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)

ลำดับ	สารมลพิษ	วิธีการหาค่า
58	Diethyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
59	2,4-Dimethylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
60	2,4-Dinitrophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
61	2,4-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
62	2,6-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
63	Di-n-Octyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
64	Endosulfan	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
65	Endrin	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
66	Ethylbenzene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
67	Fluoranthene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
68	Fluorene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
69	Heptachlor	1) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,23) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
70	Heptachlor epoxide	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)

ลำดับ	สารเคมี	วิธีวิเคราะห์
70	Heptachlor epoxide (ต่อ)	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
71	Hexachlorobenzene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
72	Hexachloro-1,3-butadiene	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
73	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
74	α -HCH	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
75	β -HCH	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
76	γ -HCH	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
77	Hexachlorocyclopentadiene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
78	Hexachloroethane	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
79	Indeno(1,2,3-cd)pyrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
80	Isophorone	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
81	Lead	1) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
82	Manganese	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)

ลำดับ	สารเคมี	วิธีการหาค่า
83	Mercury	1) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁹⁾ 2) Thermal Decomposition Amalgamation and Atomic Absorption Spectrometric Method ⁽²⁰⁾ Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
84	Methanol	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
85	Methoxychlor	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
86	Methyl bromide	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
87	Methylene chloride	2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
88	2-Methylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
89	2-Methylnaphthalene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
90	Methyl tert-butyl ether	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,25)
91	Naphthalene	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) 1) Digestion, Flame Atomic Absorption Spectrometric Method ^(7,15)
92	Nickel	2) Digestion, Inductively Coupled Plasma Method ^(7,14)
93	Nitrobenzene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
94	N-Nitrosodiphenylamine	1) Digestion, Inductively Coupled Plasma Method ^(7,14) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
95	N-Nitrosodi-n-propylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
96	Polychlorinated Biphenyls - Aroclor 1016	Ultrasonic Extraction, Gas Chromatographic Method ^(10,24)

ลำดับ	สารมลพิษ	วิธีวิเคราะห์
96	Polychlorinated Biphenyls(คอป) - Aroclor 1221 - Aroclor 1232 - Aroclor 1242 - Aroclor 1248 - Aroclor 1254 - Aroclor 1260 Polychlorinated Biphenyls - 2-Chlorobiphenyl - 2,3-Dichlorobiphenyl - 2,2',5'-Trichlorobiphenyl - 2,4',5'-Trichlorobiphenyl - 2,2',3,5'-Tetrachlorobiphenyl - 2,2',5,5'-Tetrachlorobiphenyl - 2,3',4,4'-Tetrachlorobiphenyl - 2,2',3,4,5'- Pentachlorobiphenyl - 2,2',4,5,5'- Pentachlorobiphenyl - 2,3,3',4',6- Pentachlorobiphenyl - 2,2',3,4,4',5'- Hexachlorobiphenyl - 2,2',3,4,5,5'- Hexachlorobiphenyl - 2,2',3,5,5',6- Hexachlorobiphenyl - 2,2',4,4',5,5'- Hexachlorobiphenyl - 2,2',3,3',4,4',5- Heptachlorobiphenyl - 2,2',3,4,4',5,5'- Heptachlorobiphenyl - 2,2',3,4,4',5',6- Heptachlorobiphenyl - 2,2',3,4',5,5',6- Heptachlorobiphenyl - 2,2',3,3',4,4',5,5',6- Nonachlorobiphenyl	2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28) Ultrasonic Extraction, Gas Chromatographic Method ^(10,28)

ลำดับ	สารเคมี	วิธีวิเคราะห์
97	Pentachlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
98	Phenanthrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,29) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
99	Phenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
100	Pyrene	1) Ultrasonic Extraction, Gas Chromatographic Method ^(10,29) 2) Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
101	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^(7,21) 2) Digestion, Inductively Coupled Plasma Method ^(7,14)
102	Silver	Digestion, Inductively Coupled Plasma Method ^(7,14)
103	Styrene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
104	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
105	Tetrachloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
106	Toluene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
107	Toxaphene	Ultrasonic Extraction, Gas Chromatographic Method ^(10,23)
108	TPH (C ₅ -C ₈)	1) Purge and Trap, Gas Chromatographic Method ^(13,22) 2) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(10,22)
109	TPH (C ₈ -C ₁₆)	Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)
110	TPH (C ₅ -C ₃₅)	Ultrasonic Extraction, Gas Chromatographic Method ^(10,22)

111 1,2,4-Trichlorobenzene...

ลำดับ	สารเคมี	วิธีวิเคราะห์
111	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
112	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
113	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
114	Trichloroethylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
115	2,4,5-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
116	2,4,6-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(10,28)
117	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
118	Vanadium	Digestion, Inductively Coupled Plasma Method ^(7,14)
119	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
120	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27)
121	m-Xylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
122	o-Xylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
123	p-Xylene	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)
124	Xylene (Total)	1) Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(13,27) 2) Equilibrium Headspace, Gas Chromatographic/Mass Spectrometric Method ^(11,27)

125 Zinc...

ลำดับ	สามลพิษ	วิธีวิเคราะห์
125	Zinc	1) Digestion, Flame Atomic Absorption Spectrometric Method ^[7,15] 2) Digestion, Inductively Coupled Plasma Method ^[7,14]

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