เอกสารแนบ 16

เอกสารอนุญาตห้องปฏิบัติการ

สิ่งที่ส่งมาด้วย ๑

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด เลขทะเบียน ว-๑๔๒
ที่ อก ๐๓๑๐(๑)/ ๑๓๗๖๘ ลงวันที่ ๒๖ กันยายน ๒๕๖๕

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๓๒ ราย

[redacted]

น.16/1

ที่ อก ๐๓๑๐(๑)/ ๑๓๗๖๘

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๖ กันยายน ๒๕๖๕

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๑๘ พฤษภาคม ๒๕๖๕

สิ่งที่ส่งมาด้วย ๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๓๒ ราย
๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓๕ ราย
๓. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม

ตามหนังสือที่อ้างถึง บริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๑๔๒ สถานที่ตั้งเลขที่ ๖ ซอยงามวงศ์วาน ๕ ตำบลบางเขน อำเภอเมืองนนทบุรี จังหวัดนนทบุรี ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๓๒ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓๕ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย น้ำใต้ดิน อากาศเสีย สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว และดิน ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๕ กรกฎาคม ๒๕๖๘ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม ตาม QR Code ท้ายหนังสือฉบับนี้

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

[redacted]

ขอผ่านระบบอิเล็กทรอนิกส์

กองวิจัยและเตือนภัยมลพิษโรงงาน
กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ
โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕
โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๙
ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด เลขทะเบียน ว-๑๕๒
ที่ อก ๐๓๑๐(๑)/ ๑๓๗๖๘ ลงวันที่ ๒๖ กันยายน ๒๕๖๕

ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๐๐ รายการ

น้ำเสีย จำนวน 27 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method[4]
		2) Digestion, Inductively Coupled Plasma Method[4]
2	Barium	1) Digestion, Direct Nitrous Oxide-Acetylene Flame Method[4]
		2) Digestion, Inductively Coupled Plasma Method[4]
3	Biochemical Oxygen Demand	1) 5-Day BOD Test, Azide Modification Method[4]
		2) 5-Day BOD Test, Membrane Electrode Method[4]
4	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method[4]
		2) Digestion, Inductively Coupled Plasma Method[4]
5	Chemical Oxygen Demand	1) Open Reflux, Titrimetric Method[4]
		2) Closed Reflux, Titrimetric Method[4]
6	Chromium	1) Digestion, Direct Air-Acetylene Flame Method[4]
		2) Digestion, Inductively Coupled Plasma Method[4]
7	Color	ADMI Weighted-Ordinate Spectrophotometric Method[4]
8	Copper	1) Digestion, Direct Air-Acetylene Flame Method[4]
		2) Digestion, Inductively Coupled Plasma Method[4]
9	Cyanide	Distillation, Colorimetric Method[4]
10	Formaldehyde	Distillation, Colorimetric Method[3]
11	Free Chlorine	DPD Colorimetric Method[4]
12	Hexavalent Chromium	Colorimetric Method[4]
13	Lead	1) Digestion, Direct Air-Acetylene Flame Method[4]
		2) Digestion, Inductively Coupled Plasma Method[4]
14	Manganese	1) Digestion, Direct Air-Acetylene Flame Method[4]
		2) Digestion, Inductively Coupled Plasma Method[4]
15	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method[4]
16	Nickel	1) Digestion, Direct Air-Acetylene Flame Method[4]
		2) Digestion, Inductively Coupled Plasma Method[4]

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด เลขทะเบียน ว-๑๕๒
ที่ อก ๐๓๑๐(๑)/ ๑๓๗๖๘ ลงวันที่ ๒๖ กันยายน ๒๕๖๕

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓๕ ราย

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ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
17	Oil & Grease	1) Liquid-Liquid, Partition-Gravimetric Method[4] 2) Soxhlet Extraction Method[4]
18	pH	Electrometric Method[4]
19	Phenols	Distillation, Direct Photometric Method[4]
20	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method[4] 2) Digestion, Inductively Coupled Plasma Method[4]
21	Sulfide	1) Iodometric Method[4] 2) Methylene Blue Method[4]
22	Temperature	Laboratory and Field Methods[4]
23	Total Dissolved Solids	Dried at 180 °C[4]
24	Total Kjeldahl Nitrogen	1) Macro-Kjeldahl Method[4] 2) Semi-Micro-Kjeldahl Method[4]
25	Total Suspended Solids	Dried at 103-105 °C[4]
26	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation[4] 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation[4]
27	Zinc	1) Digestion, Direct Air-Acetylene Flame Method[4] 2) Digestion, Inductively Coupled Plasma Method[4]

น้ำใต้ดิน จำนวน 16 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	1) Digestion, Direct Air-Acetylene Flame Method[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method[4] 3) Digestion, Inductively Coupled Plasma Method[4]
2	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method[4] 3) Digestion, Inductively Coupled Plasma Method[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Barium	1) Digestion, Direct Nitrous Oxide-Acetylene Flame Method[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method[4] 3) Digestion, Inductively Coupled Plasma Method[4]
4	Beryllium	1) Digestion, Direct Nitrous Oxide-Acetylene Flame Method[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method[4] 3) Digestion, Inductively Coupled Plasma Method[4]
5	Cadmium	1) Digestion, Direct Air-Acetylene Flame Method[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method[4] 3) Digestion, Inductively Coupled Plasma Method[4]
6	Chromium	1) Digestion, Direct Air-Acetylene Flame Method[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method[4] 3) Digestion, Inductively Coupled Plasma Method[4]
7	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Colorimetric Method; Calculation[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method; Colorimetric Method; Calculation[4] 3) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation[4]
8	Chromium (VI)	Colorimetric Method[4]
9	Lead	1) Digestion, Direct Air-Acetylene Flame Method[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method[4] 3) Digestion, Inductively Coupled Plasma Method[4]
10	Manganese	1) Digestion, Direct Air-Acetylene Flame Method[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method[4] 3) Digestion, Inductively Coupled Plasma Method[4]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Beryllium	1) Isokinetic Sampling, Digestion, Direct Nitrous Oxide-Acetylene Flame Method[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method[5]
4	Cadmium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method[5] 2) Isokinetic Sampling, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[5] 3) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method[5]
5	Carbon Monoxide	Instrumental Analyzer Method[5]
6	Chlorine	1) Absorption Sampling, Ion Chromatographic Method 2) Isokinetic Sampling, Ion Chromatographic Method[5]
7	Chromium	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method[5]
8	Cobalt	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method[5] 2) Isokinetic Sampling, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[5] 3) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method[5]
9	Copper	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method[5]
10	Cresol	Absorption Sampling, Gas Chromatographic Method[5]
11	Hydrogen Chloride	1) Absorption Sampling, Ion Chromatographic Method 2) Isokinetic Sampling, Ion Chromatographic Method[5]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
11	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method[4]
12	Nickel	1) Digestion, Direct Air-Acetylene Flame Method[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method[4] 3) Digestion, Inductively Coupled Plasma Method[4]
13	pH	Electrometric Method[4]
14	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method[4] 3) Digestion, Inductively Coupled Plasma Method[4]
15	Silver	1) Digestion, Direct Air-Acetylene Flame Method[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method[4] 3) Digestion, Inductively Coupled Plasma Method[4]
16	Zinc	1) Digestion, Direct Air-Acetylene Flame Method[4] 2) Digestion, Electrothermal Atomic Absorption Spectrometric Method[4] 3) Digestion, Inductively Coupled Plasma Method[4]

<u>อากาศเสีย (ปล่องระบาย) จำนวน 25 รายการ</u>

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method[5] 2) Isokinetic Sampling, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[5] 3) 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, Graphite Furnace Atomic Absorption Spectrometric Method[5] 3) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method[5]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
23	Tin	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method[5] 2) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method[5]
24	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method[5]
25	Xylene	Adsorption Sampling, Gas Chromatographic Method[5]

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 17 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method[1,6,11] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[1,6,12] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,10] 4) Digestion, Flame Atomic Absorption Spectrometric Method[7,11] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 6) Digestion, Inductively Coupled Plasma Method[7,10]
2	Arsenic	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method [1,6,13] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[1,6,12] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,10] 4) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method[7,13] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 6) Digestion, Inductively Coupled Plasma Method[7,10]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
12	Hydrogen Fluoride	1) Absorption Sampling, Ion Chromatographic Method[5] 2) Isokinetic Sampling, Ion Chromatographic Method[5]
13	Hydrogen Sulfide	Absorption Sampling, Iodometric Method[5]
14	Lead	1) Isokinetic Sampling, Digestion, Direct Air-Acetylene Flame Method[5] 2) Isokinetic Sampling, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[5] 3) 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[2]
19	Oxides of Nitrogen	Instrumental Analyzer Method[5]
20	Selenium	1) Isokinetic Sampling, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method[5] 2) Isokinetic Sampling, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[5] 3) Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method[5]
21	Sulfur Dioxide	1) Isokinetic Sampling, Barium-Thorin Titrimetric Method[5] 2) Instrumental Analyzer Method[5]
22	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method[5]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Barium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method[1,6,11] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[1,6,12] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,10] 4) Digestion, Flame Atomic Absorption Spectrometric Method[7,11] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 6) Digestion, Inductively Coupled Plasma Method[7,10]
4	Beryllium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method[1,6,11] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[1,6,12] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,10] 4) Digestion, Flame Atomic Absorption Spectrometric Method[7,11] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 6) Digestion, Inductively Coupled Plasma Method[7,10]
5	Cadmium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method[1,6,11] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[1,6,12] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,10] 4) Digestion, Flame Atomic Absorption Spectrometric Method[7,11] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 6) Digestion, Inductively Coupled Plasma Method[7,10]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
6	Chromium	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method[1,6,11] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[1,6,12] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,10] 4) Digestion, Flame Atomic Absorption Spectrometric Method[7,11] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 6) Digestion, Inductively Coupled Plasma Method[7,10]
7	Chromium (III)	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation[1,6,9,11,14] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method; Waste Extraction, Colorimetric Method; Calculation[1,6,9,12,14] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method; Waste Extraction, Colorimetric Method; Calculation[1,6,9,10,14] 4) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation[7,9,11,14] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation[7,9,12,14] 6) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation[7,9,10,14]
8	Chromium (VI)	1) Waste Extraction, Colorimetric Method[1,14] 2) Alkaline Digestion, Colorimetric Method[9,14]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
9	Cobalt	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method[1,6,11] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[1,6,12] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,10] 4) Digestion, Flame Atomic Absorption Spectrometric Method[7,11] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 6) Digestion, Inductively Coupled Plasma Method[7,10]
10	Copper	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method[1,6,11] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[1,6,12] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,10] 4) Digestion, Flame Atomic Absorption Spectrometric Method[7,11] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 6) Digestion, Inductively Coupled Plasma Method[7,10]
11	Lead	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method[1,6,11] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[1,6,12] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,10] 4) Digestion, Flame Atomic Absorption Spectrometric Method[7,11] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 6) Digestion, Inductively Coupled Plasma Method[7,10]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
12	Mercury	1) Waste Extraction, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method[1,15] 2) Digestion, Cold-Vapor Atomic Absorption Spectrometric Method[16]
13	Nickel	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method[1,6,11] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[1,6,12] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,10] 4) Digestion, Flame Atomic Absorption Spectrometric Method[7,11] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 6) Digestion, Inductively Coupled Plasma Method[7,10]
14	Selenium	1) Waste Extraction, Digestion, Hydride Generation/Atomic Absorption Spectrometric Method[1,6,17] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[1,6,12] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,10] 4) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method[7,17] 5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 6) Digestion, Inductively Coupled Plasma Method[7,10]
15	Silver	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method[1,6,11] 2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[1,6,12] 3) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,10]

น.16/7

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
		4) Digestion, Flame Atomic Absorption Spectrometric Method[7,11]
		5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12]
		6) Digestion, Inductively Coupled Plasma Method[7,10]
16	Trichloroethylene	Headspace, Gas chromatographic Method[8,18]
17	Zinc	1) Waste Extraction, Digestion, Flame Atomic Absorption Spectrometric Method[1,6,11]
		2) Waste Extraction, Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[1,6,12]
		3) Waste Extraction, Digestion, Inductively Coupled Plasma Method[1,6,10]
		4) Digestion, Flame Atomic Absorption Spectrometric Method[7,11]
		5) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12]
		6) Digestion, Inductively Coupled Plasma Method[7,10]

ดิน จำนวน 15 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Antimony	1) Digestion, Flame Atomic Absorption Spectrometric Method[7,11]
		2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12]
		3) Digestion, Inductively Coupled Plasma Method[7,10]
2	Arsenic	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method[7,13]
		2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12]
		3) Digestion, Inductively Coupled Plasma Method[7,10]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
3	Barium	1) Digestion, Flame Atomic Absorption Spectrometric Method[7,11]
		2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12]
		3) Digestion, Inductively Coupled Plasma Method[7,10]
4	Beryllium	1) Digestion, Flame Atomic Absorption Spectrometric Method[7,11]
		2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12]
		3) Digestion, Inductively Coupled Plasma Method[7,10]
5	Cadmium	1) Digestion, Flame Atomic Absorption Spectrometric Method[7,11]
		2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12]
		3) Digestion, Inductively Coupled Plasma Method[7,10]
6	Chromium	1) Digestion, Flame Atomic Absorption Spectrometric Method[7,11]
		2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12]
		3) Digestion, Inductively Coupled Plasma Method[7,10]
7	Chromium (III)	1) Digestion, Flame Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation[7,9,11,14]
		2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method; Alkaline Digestion, Colorimetric Method; Calculation[7,9,12,14]
		3) Digestion, Inductively Coupled Plasma Method; Alkaline Digestion, Colorimetric Method; Calculation[7,9,10,14]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
8	Chromium (VI)	Alkaline Digestion, Colorimetric Method[9,14]
9	Lead	1) Digestion, Flame Atomic Absorption Spectrometric Method[7,11] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 3) Digestion, Inductively Coupled Plasma Method[7,10]
10	Manganese	1) Digestion, Flame Atomic Absorption Spectrometric Method[7,11] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 3) Digestion, Inductively Coupled Plasma Method[7,10]
11	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method[16]
12	Nickel	1) Digestion, Flame Atomic Absorption Spectrometric Method[7,11] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 3) Digestion, Inductively Coupled Plasma Method[7,10]
13	Selenium	1) Digestion, Hydride Generation/Atomic Absorption Spectrometric Method[7,17] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 3) Digestion, Inductively Coupled Plasma Method[7,10]
14	Silver	1) Digestion, Flame Atomic Absorption Spectrometric Method[7,11] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 3) Digestion, Inductively Coupled Plasma Method[7,10]

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
15	Zinc	1) Digestion, Flame Atomic Absorption Spectrometric Method[7,11] 2) Digestion, Graphite Furnace Atomic Absorption Spectrometric Method[7,12] 3) Digestion, Inductively Coupled Plasma Method[7,10]

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ที่ อก ๐๓๑๐(๑)/ ๑๑๖๗๖

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๑๐ สิงหาคม ๒๕๖๖

เรื่อง เปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๓๑ กรกฎาคม ๒๕๖๖

ตามหนังสือที่อ้างถึง บริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด ห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๑๕๒ สถานที่ตั้งเลขที่ ๖ ซอยงามวงศ์วาน ๕ ตำบลบางเขน อำเภอเมืองนนทบุรี จังหวัดนนทบุรี ขอเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์ ความละเอียดแจ้งแล้ว นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้เพิ่มเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒ ราย ได้แก่

๑) [redacted]
๒)

อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน คือในวันที่ ๕ กรกฎาคม ๒๕๖๘ ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

[redacted]

กองวิจัยและเตือนภัยมลพิษโรงงาน
กลุ่มมาตรฐานวิธีการวิเคราะห์ทดสอบมลพิษและทะเบียนห้องปฏิบัติการ
โทร. ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๐๓-๕
โทรสาร ๐ ๒๔๓๐ ๖๓๑๒ ต่อ ๒๑๙๙
ไปรษณีย์อิเล็กทรอนิกส์ saraban@diw.mail.go.th

Green Industry
"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"

แบบ กภ.บญ
นิติบุคคล

กรมสวัสดิการและคุ้มครองแรงงาน

ใบอนุญาต

เป็นนิติบุคคลผู้ให้บริการตรวจวัดระดับความเข้มข้นของสารเคมีอันตราย

ในบรรยากาศของสถานที่ทำงานและสถานที่เก็บรักษาสารเคมีอันตราย

ใบอนุญาตเลขที่ ๐๒๐๑-๐๓-๒๕๖๕-๐๐๕๒

อนุญาตให้ บริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด

เลขทะเบียนนิติบุคคล ๐๑๐๕๕๓๙๐๐๗๙๓๙

ตั้งอยู่ เลขที่ ๖ ซอยงามวงศ์วาน ๕ ตำบลบางเขน อำเภอเมืองนนทบุรี จังหวัดนนทบุรี

เป็นนิติบุคคลผู้ให้บริการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามกฎกระทรวงกำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงานเกี่ยวกับสารเคมีอันตราย พ.ศ. ๒๕๕๖ ในการเป็นผู้ให้บริการตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงานและสถานที่เก็บรักษาสารเคมีอันตราย ประกอบกับกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ แห่งพระราชบัญญัติความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๕๔ โดยมีบุคลากร จำนวน ๔๔ ราย ดังรายชื่อแนบท้ายใบอนุญาตนี้

ทั้งนี้ ตั้งแต่วันที่ ๑๕ มิถุนายน พ.ศ. ๒๕๖๕ ถึงวันที่ ๑๓ มิถุนายน พ.ศ. ๒๕๖๘

ให้ไว้ ณ วันที่ ๑๕ มิถุนายน พ.ศ. ๒๕๖๕

[redacted]

อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

น.16/11

ที่ รง ๐๕๐๔/๔๗๕๐

กรมสวัสดิการและคุ้มครองแรงงาน
ถนนมิตรไมตรี ดินแดง กรุงเทพฯ ๑๐๔๐๐

๑๕ มิถุนายน ๒๕๖๕

เรื่อง การขออนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายฯ

เรียน กรรมการผู้จัดการบริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด

อ้างถึง แบบคำขอและรับคำขอใบอนุญาตฯ ของบริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด

สิ่งที่ส่งมาด้วย ๑. ใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายฯ และรายชื่อบุคลากรแนบท้ายใบอนุญาต ลงวันที่ ๑๕ มิถุนายน พ.ศ. ๒๕๖๕ จำนวน ๑ ฉบับ
๒. ใบอนุญาตเป็นนิติบุคคลผู้ให้บริการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายฯ และรายชื่อบุคลากรแนบท้ายใบอนุญาต ลงวันที่ ๑๕ มิถุนายน พ.ศ. ๒๕๖๕ จำนวน ๑ ฉบับ

ตามหนังสือที่อ้างถึง บริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด ได้ยื่นแบบคำขอและรับคำขอใบอนุญาต แบบ กภ.บญ.๑๑ (นิติบุคคล) เป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงานและสถานที่เก็บรักษาสารเคมีอันตราย ตามกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ เพื่อให้กรมสวัสดิการและคุ้มครองแรงงานพิจารณา ความละเอียดแจ้งแล้ว นั้น

กรมสวัสดิการและคุ้มครองแรงงาน ได้พิจารณาแล้วเห็นว่าการยื่นแบบคำขอและรับคำขอใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายฯ ของบริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด เป็นไปตามกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัยฯ ประกอบกับกฎกระทรวงกำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงานเกี่ยวกับสารเคมีอันตราย พ.ศ. ๒๕๕๖ จึงออกใบอนุญาตให้บริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด เป็นนิติบุคคลผู้ให้บริการตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายฯ พร้อมบุคลากร จำนวน ๔๔ ราย โดยมีใบอนุญาตเลขที่ ๐๒๐๑-๐๓-๒๕๖๕-๐๐๕๒ และเป็นผู้ให้บริการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายฯ พร้อมบุคลากร จำนวน ๕๕ ราย โดยมีใบอนุญาตเลขที่ ๐๒๐๒-๐๓-๒๕๖๕-๐๐๓๗ รายละเอียดปรากฏตามสิ่งที่ส่งมาด้วย ทั้งนี้ ขอให้บริษัทฯ ปฏิบัติตามกฎกระทรวงการขึ้นทะเบียน และการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัยฯ อย่างเคร่งครัด

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

[redacted]

กองความปลอดภัยแรงงาน
โทรศัพท์ ๐ ๒๔๔๘ ๙๑๒๘ - ๓๙ ต่อ ๗๐๓
โทรสาร ๐ ๒๔๔๘ ๙๑๔๓

รายชื่อบุคลากรแนบท้ายใบอนุญาต
เป็นนิติบุคคลผู้ให้บริการตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงาน
และสถานที่เก็บรักษาสารเคมีอันตราย
ของบริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด
ใบอนุญาตเลขที่ ๐๒๐๑-๐๓-๒๕๖๕-๐๐๕๒

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น.16/12

เลขทะเบียนควบคุม [redacted]

(ลงนาม) [redacted] นายทะเบียน)

ผู้อำนวยการกองความปลอดภัยแรงงาน

แบบ กภ.บญ
นิติบุคคล

กรมสวัสดิการและคุ้มครองแรงงาน

ใบอนุญาต

เป็นนิติบุคคลผู้ให้บริการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตราย

ในบรรยากาศของสถานที่ทำงานและสถานที่เก็บรักษาสารเคมีอันตราย

ใบอนุญาตเลขที่ ๐๒๐๒-๐๓-๒๕๖๕-๐๐๓๗

อนุญาตให้ บริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด

เลขทะเบียนนิติบุคคล ๐๑๐๕๕๓๙๐๐๗๙๓๙

ตั้งอยู่ เลขที่ ๖ ซอยงามวงศ์วาน ๕ ตำบลบางเขน อำเภอเมืองนนทบุรี จังหวัดนนทบุรี

เป็นนิติบุคคลผู้ให้บริการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามกฎกระทรวงกำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงานเกี่ยวกับสารเคมีอันตราย พ.ศ. ๒๕๕๖ ในการเป็นผู้ให้บริการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงานและสถานที่เก็บรักษาสารเคมีอันตราย ประกอบกับกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ แห่งพระราชบัญญัติความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๕๔ โดยมีบุคลากร จำนวน ๕๕ ราย ดังรายชื่อแนบท้ายใบอนุญาตนี้

ทั้งนี้ ตั้งแต่วันที่ ๑๔ มิถุนายน พ.ศ. ๒๕๖๕ ถึงวันที่ ๑๓ มิถุนายน พ.ศ. ๒๕๖๘

ให้ไว้ ณ วันที่ ๑๔ มิถุนายน พ.ศ. ๒๕๖๕

[redacted]

อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

น.16/13

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ทั้งนี้ ตั้งแต่วันที่ ๑๔ มิถุนายน พ.ศ. ๒๕๖๕ ถึงวันที่ ๑๓ มิถุนายน พ.ศ. ๒๕๖๘

ให้ไว้ ณ วันที่ ๑๔ มิถุนายน พ.ศ. ๒๕๖๕

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อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากรแนบท้ายใบอนุญาต
เป็นนิติบุคคลผู้ให้บริการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงาน
และสถานที่เก็บรักษาสารเคมีอันตราย
ของบริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด
ใบอนุญาตเลขที่ ๐๒๐๒-๐๓-๒๕๖๕-๐๐๓๗

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น.16/14

เลขทะเบียนควบคุม
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(ลงนาม)[redacted]

ผู้อำนวยการกองความปลอดภัยแรงงาน

Certificate of Calibration

Method 5 Pre-Test Calibration - Liters (L)

UUT Meter Console Information		Calibration Conditions		Factors/Conversions		Reference Equipment	
Model #:	XC-572-V	Bar. Pressure (mm Hg):	758.3	Std. Temp. (K):	293.15	Calibration Meter Model:	DGMR-200H
Serial #:	A1912535	Ambient Temperature (°C):	25.6	Std. Press. (mm Hg):	760	Cal. Date:	03-Jun-22
DGM Model #:	SK25EX	Relative Humidity (%):	40	K_1 (K/mm Hg):	0.3857	Serial No.:	0000026
DGM Serial #:	00006056	Altitude (m):	1.83			Gamma:	1.0000
		Bar. Pressure Corr. (mm Hg):	758.2				

UUT Meter (DGM)							Reference Meter (WTM)					
Run Time (seconds)	Orifice, ΔH (mm H2O)	Volume			Meter Temperature (°C)		Meter Pressure (in H2O)	Volume (L)			Outlet Temperature (°C)	
		Initial (L)	Final (L)	Total (L)	Initial	Final		Initial	Final	Total	Initial	Final
Θ	$P_{m(g)}$	V_{mi}	V_{mf}	V_m	t_{mi}	t_{mf}	P_w	V_{wi}	V_{wf}	V_w	t_{wi}	t_{wf}
840.00	13.00	148542.0	148705.2	163.2	25.0	25.0	0.3	0.00	164.61	164.61	25.0	25.0
600.00	25.00	148705.2	148858.4	153.2	25.0	25.0	0.5	0.00	154.10	154.10	25.0	25.0
453.00	50.00	148858.4	149024.2	165.8	25.0	26.0	0.6	0.00	166.50	166.50	25.0	25.0
370.00	80.00	149024.2	149192.8	168.6	26.0	26.0	2.0	0.00	171.82	171.82	25.0	25.0
310.00	120.00	149192.8	149363.6	170.8	26.0	27.0	2.4	0.00	174.51	174.51	25.0	25.0

Standardized Data

Reference Meter (L)		UUT Meter (L)		Correction Factor		ΔH @ (mm H2O)	
Std. Vol.	Std. Flow	Std. Vol.	Std. Flow	Value	Variation	0.0212 SCMM	Variance
$V_{w(std)}$	$Q_{w(std)}$	$V_{m(std)}$	$V_{w(std)}$	Y	ΔY	ΔH@	ΔΔH@
161.58	11.54	160.28	11.5	1.0081	-0.0031	43.3	-3.811
151.33	15.13	150.63	15.1	1.0047	-0.0065	48.5	1.425
163.55	21.66	163.14	21.7	1.0025	-0.0087	47.4	0.319
169.36	27.46	166.10	27.5	1.0196	0.0084	47.6	0.487
172.18	33.33	168.63	33.3	1.0211	0.0099	48.7	1.580
				1.0112	**= Y Avg.**	**47.1**	**= ΔH@ Avg.** Metric

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

Note: For $\Delta H_@$, orifice pressure differential that equates to 0.0212m³/min at standard temperature and pressure, acceptable tolerance of individual values from the average is +-0.2inches (5.1mm) H_2O.

Pass/Fail Judgment : Pass

Calibrate By : Pattanaprasan P. Appproved By: [signature] Date: 9 Feb 23

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

Neediss Supply Instrument Co.,Ltd.

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[redacted]

ทั้งนี้ ตั้งแต่วันที่ ๑๘ มิถุนายน พ.ศ. ๒๕๖๕ ถึงวันที่ ๑๓ มิถุนายน พ.ศ. ๒๕๖๘

ใช้ไว้ ณ วันที่ ๑๘ มิถุนายน พ.ศ. ๒๕๖๕

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อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

neediss

Certificate of Calibration

Method 5 Console Sensor Calibration - Metric Units

Console Information		Calibration Conditions		Reference Devices	
Model #:	XC-572-V	Pbar (mm. Hg):	758.3	TC Calibrator Model:	CC-VTR-SH
Serial #:	A1912535	Humidity (%):	40	Reference #:	091109269
Units:	Metric	Tamb (°C):	25.6	Barometer Model:	736930
		Elevation (m):	1.8	Reference #:	EBARODIALSPE01
		Corr. Pbar (mm. Hg):	758.2	Pressure Model:	718 30G
				Reference #:	9543013

Temperature Display Calibration Data

Reference Point[1]	Reference Temp.	Test Thermocouple Calibrations						Reference Point Status[2]
		Aux	Stack	Probe	Oven	Filter	Exit	
#	°C	°C	°C	°C	°C	°C	°C	Pass/Fail
1	-18	-17	-17	-17	-17	-17	-17	PASS
2	38	38	38	38	38	37	37	PASS
3	93	93	94	94	94	93	93	PASS
4	149	149	150	150	150	149	149	PASS
5	260	259	259	260	260	259	259	PASS
6	371	371	372	372	371	371	372	PASS
7	482	482	482	483	483	482	482	PASS
8	593	593	594	594	593	593	593	PASS
9	816	815	816	816	815	815	815	PASS
10	1038	1037	1038	1038	1038	1038	1038	PASS
								PASS
								Overall Audit Status

NIST Reference Thermocouple ID: 12702001

	Ref Point	Theoretical Temp.	DGM Thermocouple Sensor Reading	ΔT_{abs}[4]
	#	°C	°C	°C
Ice Water	1	0.2	0	0.07%
Ambient[3]	2	25.6	24	0.33%
			Maximum[2]	0.33%
			Status	PASS

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

Calibrate By: Patteraporn P. Appproved By: Date: 9 Feb 23

Notes

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

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

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

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

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

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

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

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Neediss Supply Instrument Co.,Ltd.

11/16/16

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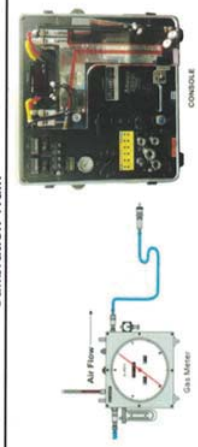
Certificate of Calibration - Supplemental

Calibration Train



Equations

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

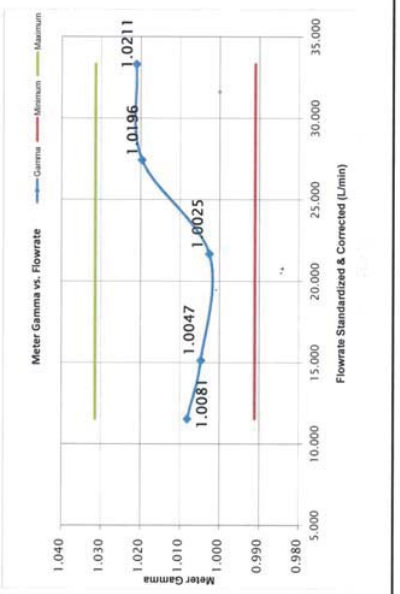
$$K_1 = \frac{K_1 V_m (P_{bar} + \frac{\Delta H}{13.6})}{T_m}$$

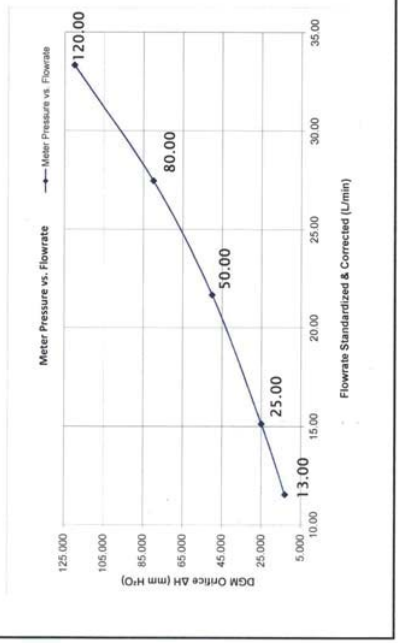
$$K_1 = \frac{T_{std}}{P_{std}} \qquad Y = \frac{V_{cr(std)}}{V_{m(std)}} \qquad Q_{a(std)} = \frac{V_{m(std)}}{\Theta}$$

$$\Delta H_@ = \frac{P_{m(std)} * 0.0011696 * (P_{bar} + \frac{\Delta H_{@}}{13.6})}{T_m} * \left(\frac{T_m * \Theta}{V_m * P_{bar}}\right)^2$$

Nomenclature

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





neediss Console Sensor Audit QA Sheet

Meter Console Information (UUT)

Model #:	XC-572-V
Serial #:	A1912535
Units:	Metric

Calibration Conditions

Pbar (mm. Hg):	758.3
Humidity (%):	40
Amb. Temp. (°C):	25.6
Altitude (m):	1.8
Corrected Pbar (mm. Hg):	758.2

Reference Devices

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

Audit Data

Reference Point	Reference Temp.	Thermocouple Probe Audit						Reference Point Status[1]
		Aux	Stack	Probe	Oven	Filter	Exit	
	°C	°C	°C	°C	°C	°C	°C	Pass/Fail
Boiling	100	100	100	100	101	100	101	PASS
Room	25.4	25	25	24	25	25	25	PASS
Ice Water	0.2	0	0	0	1	1	0	PASS

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

Calibrate By: Pattaraporn P. Appproved By: _____ Date: 9 Feb 23

Notes

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

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

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

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

neediss
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9.16/17

neediss Console Sensor Calibration Data Sheet

Console Information

Model #:	XC-572-V
Serial #:	A1912535
Units:	Metric
Type:	"English"

Calibration Conditions

Pbar (mm. Hg):	758.3
Humidity (%):	40.0
Tamb (°C):	25.6
Corr. Pbar (mm. Hg):	758.2

Reference Devices

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

Pressure Gauge / Manometer Calibration Data

Console Vacuum Calibration			
Reference Point	Reference Vacuum	Console Vacuum	Reference Point Status[5]
#	in. Hg	in. Hg	Pass/Fail
1	-5.0	-5.0	PASS
2	-15.0	-15.0	PASS
3	-20.0	-20.0	PASS

Reference Point[1]	ΔH_Manometer Calibration			Reference Point Status[2]
	Reference	Positive (+) Pitot	Negative (-) Pitot	
#	mm H2O	mm H2O	mm H2O	Pass/Fail
1	-200.000	0.0	-200.0	PASS
2	-150.000	0.0	-150.0	PASS
3	-100.000	0.0	-100.0	PASS
4	-80.000	0.0	-80.0	PASS
5	-50.000	0.0	-50.0	PASS
6	0.000	0.0	0.0	PASS
7	50.000	50.0	0.0	PASS
8	80.000	80.0	0.0	PASS
9	100.000	100.0	0.0	PASS
10	150.000	150.0	0.0	PASS
11	200.000	200.0	0.0	PASS
			ΔH Overall Audit Status	PASS

Reference Point[1]	ΔP_Manometer Calibration			Reference Point Status[2]
	Reference	Positive (+) Pitot	Negative (-) Pitot	
#	mm H2O	mm H2O	mm H2O	Pass/Fail
1	-200.000	0.0	-200.0	PASS
2	-150.000	0.0	-150.0	PASS
3	-100.000	0.0	-100.0	PASS
4	-80.000	0.0	-80.0	PASS
5	-50.000	0.0	-50.0	PASS
6	0.000	0.0	0.0	PASS
7	50.000	50.0	0.0	PASS
8	80.000	80.0	0.0	PASS
9	100.000	100.0	0.0	PASS
10	150.000	150.0	0.0	PASS
11	200.000	200.0	0.0	PASS
			ΔP Overall Audit Status	PASS

Calibrate By : Pattaraporn P. Appproved By: _____ Date: 9 Feb 23

Notes

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

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

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

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

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

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

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

I certify that the above Thermocouple Sensors were calibrated in accordance with US EPA Methods 2 and 5, CFR 40 Part 60.

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Nozzle Validation

Samplig System Equipment Information	
Console Model	XC-572-V
Console Number	A1912535
DGM Model	SK25EX
DGM Number	00006056

Validation Conditions		
Digital Calipers	CD-15APX	
Reference No	A22070181	
Temperatute	25.6	°C±3
Barometric Pressure	758.2	mm Hg

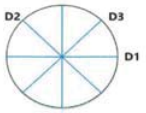
Validation Data					Results	
Nozzle ID	Nozzle Diameter				Different	($D_1 + D_2 + D_3$) / 3
Sizes		D_1	D_2	D_3	ΔD	Davg
	mm	mm	mm	mm	mm	mm
NS-4	**3.17**	3.17	3.17	3.18	0.006	3.173
NS-6	**4.77**	4.76	4.76	4.76	0.000	4.760
NS-8	**6.35**	6.36	6.36	6.36	0.000	6.360
NS-10	**7.92**	7.91	7.92	7.92	0.006	7.917
NS-12	**9.52**	9.52	9.51	9.51	0.006	9.513
NS-14	**11.09**	11.09	11.09	11.09	0.000	11.090
NS-16	**12.70**	12.71	12.71	12.72	0.006	12.713

Where :

D1, D2, D3 = There difference nozzle diamiters , mm ; diameter must be within 0.025 mm

Δ D = Maximum difference between any two diameters, must be ≤ 0.100 mm

D avg = ($D_1 + D_2 + D_3$) / 3



Validation By: Pattarapon P. Appproved By: Date: 9 Feb 23

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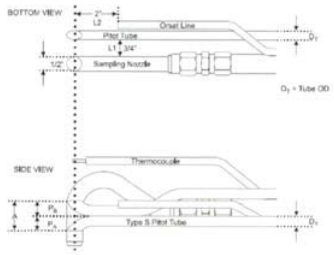
neediss Sampling Probe and Pitot Validation

Samplig System Equipment Information	
Probe Sheat	Apex 1 in. , 5 ft.
Probe Number	W1909261
Pitot tube Number	A8895
Pitot tube Type	S Type 3/8 Inc.
Validation method	Standard Probe 1 in. and 1/2 in. Sampling Nozzle

Valibration Conditions and Equipment		
Digital Calipers	CD-15APX	
Reference No.	A22070181	
Digital Inclinometer	BASELINE	
Reference No.	FEI 12-1057	
Temperatute	25.6	°C±3
Barometric Pressure	758.2	mm Hg



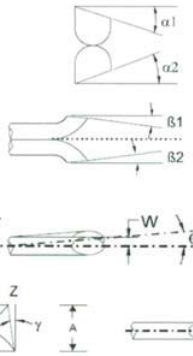
Sampling Probe Validation with Tune up

☑ Measure and Alinment with 1/2" Sampling Nozzle(12.7 mm)

	Measured		Standard Range
L_1 =	1.90	cm.	(1.905 cm. or 3/4 in.)
L_2 =	4.97	cm.	(5.08 cm. or 2.0 in.)
D_T =	0.953	cm.	(3/8 in.)
A =	2.19	cm.	(2.1 $D_T \leq A \leq 3D_T$)
$A/2D_T$ =	1.149	cm.	(1.05 $P_A / D_T \leq A \leq 1.5$)

Pitot Tube Validations and Engles measurement Result

☑ : Measure Result after Maintanance and Adjustable



P_B Size			Standard Range
α_1 =	1.40 °		≤ 10°
β_1 =	0.90 °		≤ 5°
P_A Size			
α_2 =	1.40 °		≤ 10°
β_2 =	0.30 °		≤ 5°

Engles measurement		Calculated Result	Standard Range
W =	-1.10 °	-0.042 cm.	W < 0.08 cm (1/32 in.)
Z =	0.22 °	0.008 cm.	Z < 0.032 cm (1/8 in.)

Can be use **0.84** for Cp(s) if the type of face-opening misafgnment show above with not affect the base line value of Cp(s) Solong as standard range

Validation By: Pattarapon P. Appproved By: Date: 9 Feb 23

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1. **ข้อมูล** Analyzer Calibration Error

Certified conc of calibration gas; C_V (ppm)		Measured concentration of calibration gas; C_{Dir} (ppm)	$\lvert C_v - C_{Dir} \rvert$ (ppm)	ACE=$\frac{\lvert C_V - C_{Dir} \rvert}{CS}$ (100) (%)
Low	95	95.02	0.20	0.20
Mid	450	448.60	1.40	1.00
High	950	950.00	0.00	0.00

สรุปผลการทดสอบ

ความผิดพลาดของการสอบเทียบ (Analzer (Direct) calibration error; ACE)

☑	ผ่าน ≤ ± 5 %
☐	ไม่ผ่าน > ± 5 %

2. ข้อมูลการปรับเทียบเครื่องมือด้วยก๊าซมาตรฐานที่ระดับความเข้มข้นต่ำ กลาง หรือความเข้มข้นสูง (Initial Analyzer Calibration) และ System Bias Error

Calibration gas level (ppm)		Initial values				Final values		
		C_{Dir} (ppm)	System response time (Second)	Measured concentration of calibration gas (System); C_s (ppm)	SB_i = $\frac{(C_s - C_{Dir})}{CS} \times 100$ (%)	C_s (ppm)	SB_f (%)	Driff $\lvert SB_o - SB_i \rvert$ (%)
Low level	95	95.02	300	95.05	0.03	95.40	0.40	0.37
High or mid level	950	950	300	950	0.00	950.20	0.02	0.02

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Analyzer Performance Test

Calibrated Date: 26 June 2023

Instruments Information

Analyzer Type: CO Analyzer	**Manufacturer** Thermo Environmental
Model: 48C	**S/N:** 48CHL-63257-339

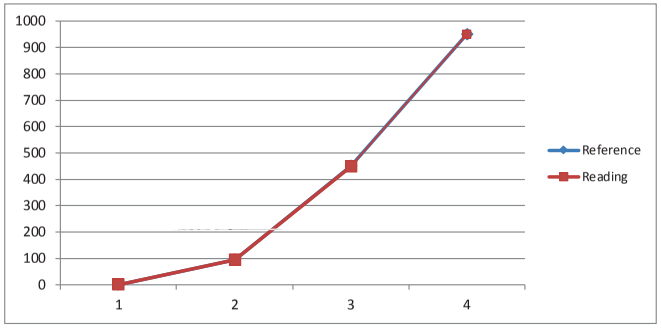
Calibration System

Calibrator Unit	*Standard Gas*
Dilutor Model Dasibi Model 5008	**NO Conc** 957.2 PPM
S/N: 705	**SO2 Conc** 960.7 PPM
ZERO AIR Genearator API MODEL 701	**CO Conc** 960.4 PPM
S/N: 1924	**Expire Date:** 29-Oct-27

Environment: Temperature 25.5 °C Humidity: 51 %RH

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	Reference	Reading	ERROR	%ERROR
ZERO	0	0	0.00	0.00
1	95	95.02	0.02	0.02
2	450	448.6	-1.40	-0.31
3	950	950	0.00	0.00
				0.07



Calibrate By:
Mr. PASAGORN SAMOL

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Analyzer Performance Test

Calibrated Date: 26 June 2023

Instruments Information

Analyzer Type: NOx Analyzer	**Manufacturer** Thermo Environmental
Model: 42C	**S/N:** 42CHL-0527613257

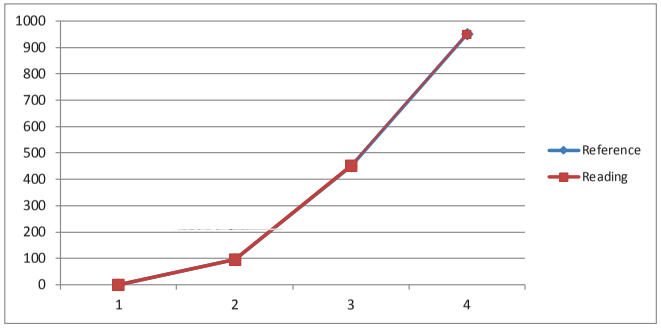
Calibration System

Calibrator Unit	*Standard Gas*
Dilutor Model Dasibi Model 5008	**NO Conc** 957.2 PPM
S/N: 705	**SO2 Conc** 960.7 PPM
ZERO AIR Genearator API MODEL 701	**CO Conc** 960.4 PPM
S/N: 1924	**Expire Date:** 29-Oct-27

Environment: Temperature 25.5 °C Humidity: 51 %RH

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	Reference	Reading	ERROR	%ERROR
ZERO	0	0	0.00	0.00
1	95	95.05	0.05	0.05
2	450	451	1.00	0.22
3	950	950.5	0.50	0.05
				0.08



Calibrate By:
Mr. PASAGORN SAMOL

น.16/20

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สรุปผลการทดสอบ

ค่า bias เริ่มต้นของระบบ (Initial system bias check; SB_i)

☑	ผ่าน $\leq \pm 5$ %
☐	ไม่ผ่าน $> \pm 5$ %

ค่า bias หลังการตรวจวัด (Post run system bias check; SB_f)

☑	ผ่าน $\leq \pm 5$ %
☐	ไม่ผ่าน $> \pm 5$ %

การประเมินค่า Driff (Driff assessment)

☑	ผ่าน $\leq \pm 3$ %
☐	ไม่ผ่าน $> \pm 3$ %

สรุปผลการทดสอบ

ค่า bias เริ่มต้นของระบบ (Initial system bias check; SB_i)

☑	ผ่าน ≤ ± 5 %
☐	ไม่ผ่าน > ± 5 %

ค่า bias หลังการตรวจวัด (Post run system bias check; SB_f)

☑	ผ่าน ≤ ± 5 %
☐	ไม่ผ่าน > ± 5 %

การประเมินค่า Driff (Driff assessment)

☑	ผ่าน ≤ ± 3 %
☐	ไม่ผ่าน > ± 3 %

น.16/21

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1. **ข้อมูล** Analyzer Calibration Error

Certified conc of calibration gas; C_V (ppm)		Measured concentration of calibration gas; C_{Dir} (ppm)	$\lvert C_v - C_{Dir} \rvert$ (ppm)	$ACE=\frac{\lvert C_V - C_{Dir} \rvert}{CS}(100)$ (%)
Low	95	95.05	0.05	0.05
Mid	450	451.00	1.00	1.00
High	950	950.50	0.50	0.00

สรุปผลการทดสอบ

ความผิดพลาดของการสอบเทียบ (Analzer (Direct) calibration error; ACE)

☑	ผ่าน ≤ ± 5 %
☐	ไม่ผ่าน > ± 5 %

2. ข้อมูลการปรับเทียบเครื่องมือด้วยก๊าซมาตรฐานที่ระดับความเข้มข้นต่ำ กลาง หรือความเข้มข้นสูง (Initial Analyzer Calibration) และ System Bias Error

Calibration gas level (ppm)		Initial values				Final values		
		C_{Dir} (ppm)	System response time (Second)	Measured concentration of calibration gas (System); C_s (ppm)	$SB_i = \frac{(C_s - C_{Dir})}{C_S} \times 100$ (%)	C_s (ppm)	SB_f (%)	Driff $\lvert SB_f - SB_i \rvert$ (%)
Low level	95	95.05	300	95.05	0.00	95.40	0.37	0.37
High or mid level	950	950.50	300	950	0.05	950.20	0.03	0.02

บริษัท เอ็นไวร์ เซอร์วิส จำกัด
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1. **ข้อมูล** Analyzer Calibration Error

Certified conc of calibration gas; C_V (ppm)		Measured concentration of calibration gas; C_{Dir} (ppm)	$\lvert C_v - C_{Dir} \rvert$ (ppm)	ACE=$\frac{\lvert C_V - C_{Dir} \rvert}{CS}$ (100) (%)
Low	95	94.10	0.90	0.95
Mid	450	450.00	0.00	1.00
High	950	950.60	0.60	0.00

สรุปผลการทดสอบ

ความผิดพลาดของการสอบเทียบ (Analzer (Direct) calibration error; ACE)

☑	ผ่าน ≤ ± 5 %
☐	ไม่ผ่าน > ± 5 %

2. ข้อมูลการปรับเทียบเครื่องมือด้วยก๊าซมาตรฐานที่ระดับความเข้มข้นต่ำ กลาง หรือความเข้มข้นสูง (Initial Analyzer Calibration) และ System Bias Error

Calibration gas level (ppm)		Initial values				Final values		
		C_{Dir} (ppm)	System response time (Second)	Measured concentration of calibration gas (System); C_s (ppm)	SB_i = $\frac{(C_s - C_{Dir})}{CS} \times 100$ (%)	C_s (ppm)	SB_f (%)	Driff $\lvert SB_o - SB_i \rvert$ (%)
Low level	95	94.10	300	95.05	1.00	95.40	1.37	0.37
High or mid level	950	950.60	300	950	0.06	950.20	0.04	0.02

น.16/22

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Analyzer Performance Test

Calibrated Date: 26 June 2023

Instruments Information

Analyzer Type: SO2 Analyzer	**Manufacturer** Thermo Environmental
Model: 42C	**S/N:** 43CHL-59690-324

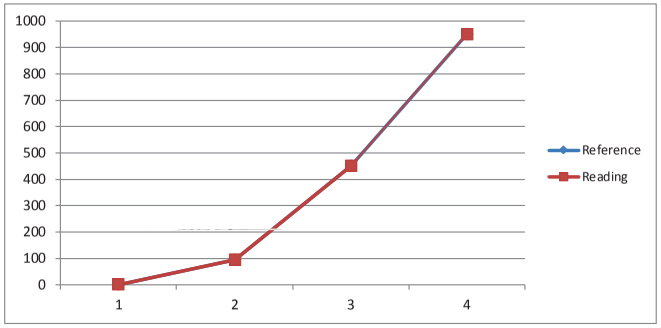
Calibration System

Calibrator Unit	*Standard Gas*
Dilutor Model Dasibi Model 5008	**NO Conc** 957.2 PPM
S/N: 705	**SO2 Conc** 960.7 PPM
ZERO AIR Genearator API MODEL 701	**CO Conc** 960.4 PPM
S/N: 1924	**Expire Date:** 29-Oct-27

Environment: Temperature 25.5 °C Humidity: 51 %RH

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	Reference	Reading	ERROR	%ERROR
ZERO	0	0	0.00	0.00
1	95	94.1	-0.90	-0.95
2	450	450	0.00	0.00
3	950	950.6	0.60	0.06
				0.22



Calibrate By:
Mr. PASAGORN SAMOL

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Accredited by

NSC-TISI-TIS 17025
Calibration 0426

NSC-TISI-TIS 17025
CALIBRATION 0426

Calibration certificate

Calibration Certificate No. 23BCI0439

Object	Electronic non-automatic weighing instrument	This calibration certificate documents the traceability to national standards.
Manufacturer	Sartorius	Uncertainties of measurements are taken into account when only statements of compliance are made.
Type	BP210D	This certificate was prepared by Sartorius Corporation in accordance to the current ISO/IEC 17025:2017 standard and Sartorius Work Instruction (Method) SOP WI 08.
Serial | QM Ident. no.	70406076 | LB - HE - 003	This certificate relate and apply this equipment only.
Customer	Health & Envitech Co., Ltd.	
	6 Ngamwongwan Soi 5,Tumbon Bangkhen Muang Nontaburi Nontaburi 11000 Thailand.	
Order no.	221429	
Number of pages	6	
Date of calibration	02 Nov 2023	

This calibration certificate may not be reproduced other than in full except with the permission of NSC-TISI-TIS-17025 and the issuing laboratory. Calibration certificates without signature are not valid.

The user is obliged to have the object recalibrated at appropriate intervals.

Date	Approval of the Calibration Certificate	Person in charge
02 Nov 2023		
	Mr. Chonchai Inthana	Chonchai Inthana

น.16/23

บริษัท เอ็นไวร์ เซอร์วิส จำกัด
42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นไวร์ เซอร์วิส จำกัด
ENVIR SERVICE CO., LTD. 42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

สรุปผลการทดสอบ

ค่า bias เริ่มต้นของระบบ (Initial system bias check; SB_i)

☑	ผ่าน ≤ ± 5 %
☐	ไม่ผ่าน > ± 5 %

ค่า bias หลังการตรวจวัด (Post run system bias check; SB_f)

☑	ผ่าน ≤ ± 5 %
☐	ไม่ผ่าน > ± 5 %

การประเมินค่า Driff (Driff assessment)

☑	ผ่าน ≤ ± 3 %
☐	ไม่ผ่าน > ± 3 %

Range 1

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	02 Nov 2023
Temperature at place of calibration | Temp. diff. $T_{weights}$ - T_{place}	24.8 °C | 0.2 K
Measuring conditions	The installation site is suitable. The device was levelled. Balance was loaded up to Max before test.
Comments	Humidity 44.6 %RH

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 1 g | 50 g		
	1 g	50 g
1	1.00000 g	50.00002 g
2	1.00000 g	50.00002 g
3	1.00000 g	50.00002 g
4	0.99999 g	50.00003 g
5	1.00000 g	50.00002 g
6	1.00000 g	50.00003 g
7	1.00001 g	50.00003 g
8	1.00000 g	50.00003 g
9	1.00001 g	50.00002 g
10	1.00000 g	50.00002 g
	s = 0.000006 g	s = 0.000005 g

Eccentricity

Test load (nominal):	50 g
Center	50.00002 g
Front left	50.00000 g
Back left	50.00000 g
Back right	50.00004 g
Front right	50.00000 g
Maximum deviation from centric loading indication $\lvert\Delta I_{ecc}\rvert_{max}$ = 0.00002 g	

Error of indication

Testload L	Indication I	Error E	Expansion factor k	Uncertainty $U(E)$	Uncertainty relative $U_{rel}(E)$
0.01000 g	0.01000 g	0.00000 g	2.00	0.000024 g	0.24 %
0.10000 g	0.10000 g	0.00000 g	2.00	0.000037 g	0.037 %
1.00000 g	0.99999 g	-0.00001 g	2.00	0.000037 g	0.0037 %
2.00003 g	2.00003 g	0.00000 g	2.00	0.000050 g	0.0025 %
5.00002 g	5.00002 g	0.00000 g	2.00	0.000050 g	0.00100 %
10.00002 g	10.00003 g	0.00001 g	2.00	0.000069 g	0.00069 %
20.00002 g	20.00002 g	0.00000 g	2.00	0.000069 g	0.00034 %
30.00004 g	30.00003 g	-0.00001 g	2.00	0.000093 g	0.00031 %
50.00002 g	50.00002 g	0.00000 g	2.00	0.000091 g	0.00018 %
60.00004 g	60.00003 g	-0.00001 g	2.00	0.00017 g	0.00028 %
77.00008 g	77.00006 g	-0.00002 g	2.00	0.00018 g	0.00023 %
Maximum error of indication		$\lvert E\rvert_{max}$ = 0.00002 g			

$U_{rel}(E)$ is the quotient of $U(E)$ and test load L. The uncertainty of measurement $U(E)$ is valid only if error E is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.
Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Calibration object

Multi range instrument

Model	BP210D	
Serial Number	70406076	
QM Ident. no | Inventory no.	LB - HE - 003 | ---	
Range	1	2
Maximum capacity (Max. load)	80.00000 g	210.0000 g
Measured range	80.00000 g	210.0000 g
Scale interval	0.00001 g	0.0001 g

Place of calibration

Address	According to page 1
Department | Cost center	QC and RD Department | ---
Building | Floor	--- | 1st Floor
Room	Laboratory Room.
Maximum temperature variation at place of calibration	5 K

Calibration procedure

EURAMET cg-18, V4.0 - Guidelines on the Calibration of Non-Automatic Weighing Instruments

Test equipment

Test equipment type	Test equipment ID	Valid until
Thermometer	MHB-382SD Cer No.C19231845,(Traceable to SI unit through DKSH)	23 Aug 2024
Test weight set OIML R111 E2	Certificate No.M2308197S ,E2(Traceable to SI unit through TCS)	24 Aug 2025

4.16/24

Uncertainty of measurement in use

Range 1

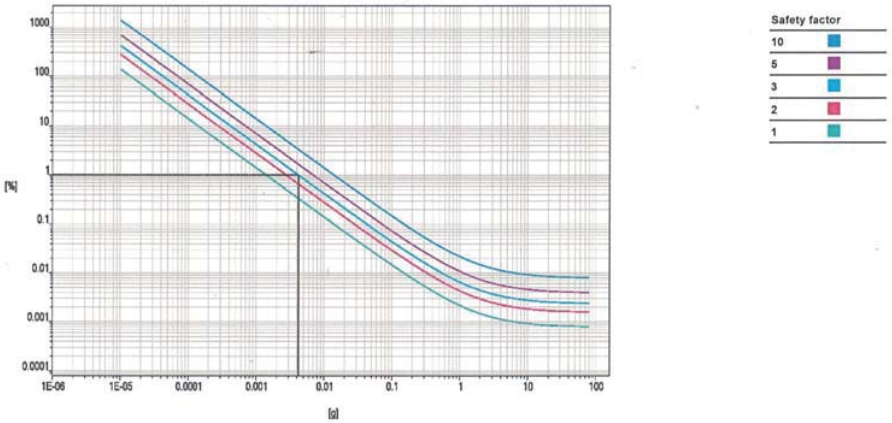
Device adjusted before measurement	Yes
Temperature deviation considered	5 K
Temperature coefficient considered	$1 \cdot 10^{-6}$/K

Uncertainty of the weighing result $U_{gl}(W)$ $U_{gl}(W) = 0.000014\ g + 7.84 \cdot 10^{-6} \cdot R$

Reference note: The current uncertainty of measurement is calculated by entering of the reading R into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from max load	Net indication R	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	0.80000 g	0.000020 g	0.0025 %
25 %	20.00000 g	0.00017 g	0.00085 %
50 %	40.00000 g	0.00033 g	0.00082 %
75 %	60.00000 g	0.00048 g	0.00081 %
100 %	80.00000 g	0.00064 g	0.00080 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.00421 g

Range 2

Adjustment Status

The measuring device was internally adjusted before the calibration.

Environmental and measuring conditions

Date of calibration	02 Nov 2023
Temperature at place of calibration | Temp. diff. $T_{weights} - T_{place}$	24.8 °C | 0.2 K
Measuring conditions	The installation site is suitable. The device was levelled. Balance was loaded up to Max before test.
Comments	Humidity 44.6 %RH

Measurement results | Measurement uncertainties

Repeatability

Test load (nominal): 100 g	
	100 g
1	99.9999 g
2	99.9999 g
3	99.9999 g
4	99.9999 g
5	99.9999 g
6	100.0000 g
7	99.9999 g
8	99.9999 g
9	99.9999 g
10	100.0000 g
	s = 0.00004 g

Eccentricity

Test load (nominal):	100 g
Center	99.9999 g
Front left	99.9999 g
Back left	99.9999 g
Back right	100.0000 g
Front right	100.0000 g
Maximum deviation from centric loading indication $\lvert\Delta_{ecc}\rvert$ max = 0.0001 g	

Error of indication

Testload L	Indication I	Error E	Expansion factor k	Uncertainty $U(E)$	Uncertainty relative $U_{rel}(E)$
0.01000 g	0.01000 g	0.00000 g	2.00	0.000024 g	0.24 %
0.10000 g	0.10000 g	0.00000 g	2.00	0.000037 g	0.037 %
1.00000 g	1.00000 g	0.00000 g	2.00	0.000037 g	0.0037 %
2.00003 g	2.00003 g	0.00000 g	2.00	0.000050 g	0.0025 %
5.00002 g	5.00002 g	0.00000 g	2.00	0.000050 g	0.00100 %
10.00002 g	10.00002 g	0.00000 g	2.00	0.000069 g	0.00069 %
20.00002 g	20.00002 g	0.00000 g	2.00	0.000069 g	0.00034 %
50.00002 g	50.00002 g	0.00000 g	2.00	0.000091 g	0.00018 %
100.0000 g	99.9999 g	-0.0001 g	2.00	0.00017 g	0.00017 %
150.0000 g	149.9999 g	-0.0001 g	2.00	0.00028 g	0.00019 %
200.0000 g	199.9999 g	-0.0001 g	2.00	0.00028 g	0.00014 %
Maximum error of indication		$\lvert E\rvert$max = 0.0001 g			

$U_{rel}(E)$ is the quotient of $U(E)$ and test load L. The uncertainty of measurement $U(E)$ is valid only if error E is considered. You will find reference notes on the uncertainty of measurement in use under: Appendix to the calibration certificate | Interpretation of measurement results.
Reference note: The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the documented Expansion factor, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

End of calibration certificate

14/16/25

Inctech Metrological Center Co.Ltd.
39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, Thailand
Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com

ilac-MRA A2LA ACCREDITED Calibration Cert. # 3884.01 ISO/IEC 17025

Certificate of Calibration

Certificate No. : MT23-6611
Page : 1 of 2

Customer	:	Health & Envitech Co.,Ltd.			
Address	:	6 Ngamwongwan Rd., Soi 5, T.Bangkhen, A.Muang Nontaburi 11000			
Description	:	Hot Air Oven	**Order No.**	:	3386/23
Manufacturer	:	Memmert	**Received date**	:	Oct 26, 2023
Model	:	UNB400	**Calibration date**	:	Oct 26, 2023
Serial No.	:	C410.0346	**Environment Condition :**		
Identification No.	:	LB-HE-030	**Temperature**	:	(25+/-10) °C
Calibration Place	:	Laboratory	**Humidity**	:	(50+/-30) %RH

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

Reference Standard Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
LXI Data Acquisition Switch Unit with Sensor	34972A	MY49020096	MT22-6392	Dec 06, 2023

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

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

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

CALIBRATION LABORATORY INCTECH METROLOGICAL CENTER CO.,LTD. IMC

Calibrated by : Mr.Akaraporn Boonlua
Issue date : Oct 31, 2023

Approved by : (Mr.Panuwat Phuklan)

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

11.16/26

Uncertainty of measurement in use

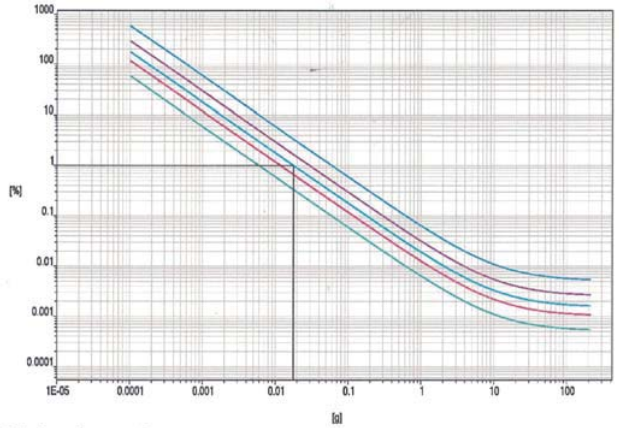
Range 2

Device adjusted before measurement	Yes
Temperature deviation considered	5 K
Temperature coefficient considered	$1 \cdot 10^{-6}$/K
Uncertainty of the weighing result $U_{gl}(W)$	**$U_{gl}(W) = 0.000059\ g + 5.14 \cdot 10^{-6} \cdot R$**

Reference note: The current uncertainty of measurement is calculated by entering of the reading *R* into this formula. In relation to this, there is no need for a correction of the indication error. The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied with an Expansion factor of 2, determined in accordance with the European Calibration Guideline EURAMET cg-18, V4.0. There is a 95 % probability that the value of the measurand will be in the assigned value range.

Indication in % from max load	Net indication *R*	Uncertainty $U_{gl}(W)$	Uncertainty relative $U_{gl}(W)_{rel}$
1 %	2.10000 g	0.000070 g	0.0033 %
25 %	52.50000 g	0.00033 g	0.00063 %
50 %	105.0000 g	0.00060 g	0.00057 %
75 %	157.5000 g	0.00087 g	0.00055 %
100 %	210.0000 g	0.0011 g	0.00054 %

Graphic realization of the relative uncertainty of measurement | process accuracy



Displayed example

Process accuracy	1.00 %
Safety factor	3
Minimum sample weight	0.01771 g

PQR No.IC-0923-064

Equipment Qualification Plan To IC System

This Qualified has Included

Performance Qualifications (PQ)

To Instrument Lists on below:

Name and Model	Serial Number	Manufacturer
ICS-1000	07090143	Dionex
AS-1	09090418	Dionex
Chromeleon	Version6.80	Dionex

This report confirms that the above instrument has been installed and performancetests the actual record and measurement results are stated on the inside of Equipment Qualification Report.

Present to Customer Name: Health & Envitech Co.,Ltd.

Address: 6 Ngamwongwan Soi 5, Tumbon Bangkhen, Muangnontaburi, Nontaburi 11000
Department: Analytical Lab

Present By: Meshcotech Co., Ltd.

Instrument System ID: LB-HE-108

Qualifier'S Signature/Date

[redacted]

Acceptor's Signature/Date

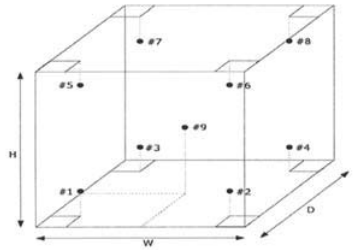
Inctech Metrological Center Co.Ltd.
39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, Thailand
Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com

ACCREDITED
Calibration Cert. # 3884.01
ISO/IEC 17025

Function : Temperature measurement
Calibration point : 104, 150, 180 °C
Result : Without adjustment
Resolution : 0.5 °C

Calibration point (°C)	Temperature of UUC* at each position (°C)									Uncertainty of measurement (+/- °C)
	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ch.8	Ch.9	
104	104.676	103.707	104.667	103.926	104.635	103.498	104.438	104.171	104.308	0.44
150	149.926	150.675	150.258	151.051	149.805	150.633	150.451	151.028	150.667	0.51
180	179.598	180.666	180.338	179.538	180.338	180.264	180.657	179.744	179.501	0.51

Setting temperature (°C)	Indicating Temperature (°C)	Measured stability (+/- °C)	Measured uniformity (°C)	Overall variation (°C)
104.0	104.0	0.19	0.99	1.6
150.0	150.0	0.25	1.2	1.7
180.0	180.0	0.21	1.4	1.8



Front view

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

UUC* = Unit under calibration
Uniformity = Maximum and Minimum difference of measured temperature at any probes and the measured temperature at the reference and same time.
Overall Variation = Difference of temperature value between the maximum and minimum any time.
Stability = One half of the maximum difference of measured temperatures at any one probe.

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น.16/27

บริษัท เมชโดเทค จำกัด
MESHCOTECH CO.,LTD.

Flow Rate Precision Result

Customer Name: **Health & Envitech Co.,Ltd.**
Department: **Analytical Lab**
System ID: **IC-01**
Manufacturer: **Dionex**
Serial No: **07090143**
Report Expiry Date: **Sep 08,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **SOP V5-EA v5r0**
Flow Meter Model: **VKIT-LFM**
Model: **ICS-1000**
Flow Meter S/N: **L-2330**
Traceable To: **4072-LFM**

The result reference to raw data on page: 1

	Flow Rate 0.5000 ml/min	Flow Rate 1.0000 ml/min	Flow Rate 1.5000 ml/min	Flow Rate 2.0000 ml/min
1	**0.4979**	**0.9967**	**1.4980**	**2.0010**
2	**0.4963**	**0.9987**	**1.4983**	**2.0009**
3	**0.4982**	**0.9977**	**1.4989**	**2.0009**
4	**0.4996**	**0.9980**	**1.4986**	**2.0010**
5	**0.4990**	**0.9969**	**1.4998**	**2.0011**
Average	**0.4982**	**0.9976**	**1.4987**	**2.0010**
%RSD	**0.2519**	**0.0821**	**0.0461**	**0.0042**

Acception criteria of %RSD ≤ 1 %

Evaluate Result **PASS**

Qualifier's signature: Pharmet Phongchat Date: 08/09/2023

Authorised's signature: Date: 08/09/2023

บริษัท เมชโดเทค จำกัด
MESHCOTECH CO.,LTD.

Flow Rate Accuracy Result

Customer Name: **Health & Envitech Co.,Ltd.**
Department: **Analytical Lab**
System ID: **IC-01**
Manufacturer: **Dionex**
Serial No: **07090143**
Report Expiry Date: **Sep 08,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **SOP V5-EA v5r0**
Flow Meter Model: **VKIT-LFM**
Model: **ICS-1000**
Flow Meter S/N: **L-2330**
Traceable To: **4072-LFM**

The result reference to raw data on page: 1

Theoretical Flow Rate ml/min.	Observed Flow Rate ml/min.		Deviation ml/min. %Error
0.5000	**0.4979**		
	0.4963		
	0.4982	**0.4982**	**0.36**
	0.4996		
	0.4990		
1.0000	**0.9967**		
	0.9987		
	0.9977	**0.9976**	**0.24**
	0.9980		
	0.9969		
1.5000	**1.4980**		
	1.4983		
	1.4989	**1.4987**	**0.09**
	1.4986		
	1.4998		
2.0000	**2.0010**		
	2.0009		
	2.0009	**2.0010**	**0.05**
	2.0010		
	2.0011		

Acception criteria of absolute deviation ≤ 1 %

Evaluate Result **PASS**

Qualifier's signature: Pharmet Phongchat Date: 08/09/2023

Authorised's signature: Date: 08/09/2023

น.16/28

บริษัท เมชโคเทค จำกัด
MESHCOTECH CO.,LTD.

Autosampler Injection Carry Over Result

Customer Name: **Health & Envitech Co.,Ltd.**
Department: **Analytical Lab**
System ID: **IC-01**
Manufacturer: **Dionex**
Serial No: **09090418**
Report Expiry Date: **Sep 08,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **SOP V5-EA v5r0**
Model: **AS-1**
Lot Number: **220701**
Traceable To: **060254**

The result reference to raw data on page: 2-13

Blank	Area
Carry Over Blank 1	0
Carry Over Blank 2	0
Standard	**Area**
Standard 1	62117.557
Standard 2	62504.412
Standard 3	62685.539
Standard 4	62137.204
Standard 5	62632.355
Standard 6	62266.866
Standard 7	62824.089
Standard 8	62075.598
Standard 9	62053.576
Standard 10	62005.139
Area Average	62330.234
% Carry Over :	0.00

Acception criteria of % Carry Over ≤ 1%

Evaluate Result **PASS**

Qualifier's signature: Pranmet Phongchat Date: 08/09/2023

Authorised's signature: Date: 08/09/2023

บริษัท เมชโคเทค จำกัด
MESHCOTECH CO.,LTD.

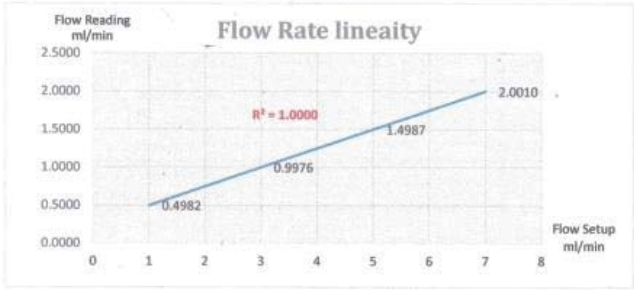
Flow Rate Linearity Result

Customer Name: **Health & Envitech Co.,Ltd.**
Department: **Analytical Lab**
System ID: **IC-01**
Manufacturer: **Dionex**
Serial No: **07090143**
Report Expiry Date: **Sep 08,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **SOP V5-GX v5r0 HPLC**
Flow Meter Model: **VKIT-LFM**
Model: **ICS-1000**
Flow Meter S/N: **L-2330**
Traceable To: **4072-LFM**

The result reference to raw data on page: 1

	Flow Rate 0.5 (ml/min)	Flow Rate 1.0000 (ml/min)	Flow Rate 1.5000 (ml/min)	Flow Rate 2.0000 (ml/min)
1	0.4979	0.9967	1.4980	2.0010
2	0.4963	0.9987	1.4983	2.0009
3	0.4982	0.9977	1.4989	2.0009
4	0.4996	0.9980	1.4986	2.0010
5	0.4990	0.9969	1.4998	2.0011
Average	0.4982	0.9976	1.4987	2.0010
	R-Square		1.0000	



Acception criteria of R^2 > 0.9980

Evaluate Result **PASS**

Qualifier's signature: Pranmet Phongchat Date: 08/09/2023

Authorised's signature: Date: 08/09/2023

น.16/29

บริษัท เมชโคเทค จำกัด
MESHCOTECH CO.,LTD.

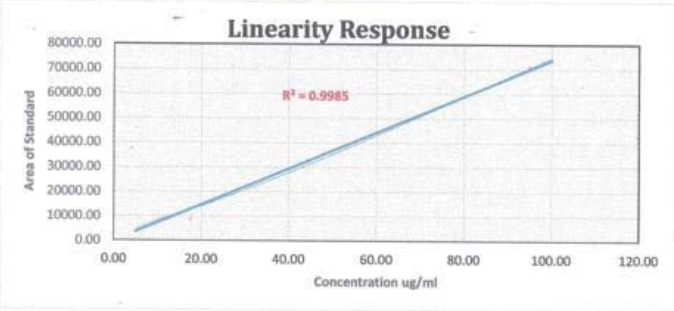
CD Detector Response Linearity Result

Customer Name: **Health & Envitech Co.,Ltd.**
Department: **Analytical Lab**
System ID: **IC-01**
Manufacturer: **Dionex**
Serial No: **07090143**
Report Expiry Date: **Sep 08,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **SOP V5-FS v5r0 HPLC**
Model: **ICS-1000**
Lot Number: **201006**
Traceable To: **060254**

The result reference to raw data on page: 24-28

Concentration (ug/ml)		Area of standard
Standard 1	5.02	**4378.816**
Standard 2	9.86	**8139.765**
Standard 3	25.02	**17456.702**
Standard 4	50.54	**35820.801**
Standard 5	100.00	**74596.992**
R-Square		**0.9985**



Acception criteria of R^2 >0.9980

Evaluate Result **PASS**

Qualifier's signature: Pharnet Phongdat
Date: 08/09/2023

Authorisedr's signature:
Date: 08/09/2023

PQR 82, Moo.18, Buengkamproi, Lamlukka,Pathum thani, Thailand 12150
Tel. (6698)970 7090 , Fax.(662)560 2541

บริษัท เมชโคเทค จำกัด
MESHCOTECH CO.,LTD.

Autosampler Injection Precision Result

Customer Name: **Health & Envitech Co.,Ltd.**
Department: **Analytical Lab**
System ID: **IC-01**
Manufacturer: **Dionex**
Serial No: **09090418**
Report Expiry Date: **Sep 08,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **SOP V5-FL v5r0 HPLC**
Model: **AS-1**
Lot Number: **201006**
Traceable To: **060254**

The result reference to raw data on page: 14-23

Injection Repeations	Area Injection 20ul	Area Injection 50ul
Injections Repeat 1	**62117.557**	**168996.834**
Injections Repeat 2	**62504.412**	**169948.976**
Injections Repeat 3	**62685.539**	**169400.425**
Injections Repeat 4	**62137.204**	**169054.271**
Injections Repeat 5	**62632.355**	**167041.198**
Injections Repeat 6	**62266.866**	**170099.238**
Injections Repeat 7	**62824.089**	**169268.542**
Injections Repeat 8	**62075.598**	**169668.971**
Injections Repeat 9	**62053.576**	**169109.679**
Injections Repeat 10	**62005.139**	**169011.021**
Average of STD Area	**62330.234**	**169159.916**
% RSD of Injections	**0.401**	**0.651**

Acception criteria of %RSI ≤ 1%

Evaluate Result **PASS**

Qualifier's signature: Pharnet Phongdat
Date: 08/09/2023

Authorised's signature:
Date: 08/09/2023

PQR 82, Moo.18, Buengkamproi, Lamlukka,Pathum thani, Thailand 12150
Tel. (6698)970 7090 , Fax.(662)560 2541

Inctech Metrological Center Co.Ltd.
39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, Thailand
Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com

Certificate of Calibration

Certificate No. : MC23-2564
Page : 1 of 2

Customer : Health & Envitech Co., Ltd.
Address : 77/11 M. 2 Ngamwongwan Rd., Soi 5, T. Bangkhen, A. Muang Nontaburi 11000

Description : Personal Sampler Calibrator
Manufacturer : SKC
Model : 303
Serial No. : N/A
Identification No. : PC-001
Calibration Place : Chemical Laboratory 2

Order No. : 3717/23
Received date : Nov 20, 2023
Calibration date : Nov 22, 2023
Environment Condition :
Temperature : (20+/-2) °C
Humidity : (50+/- 15) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MC-004* According to comparison with Analytical Balance. The calibration methods based on ASTM E542-01.

Reference Standard Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
Analytical Balance	AE-FA220	201907106	MM23-2635	Aug 07, 2024
Humidity / Baro / Temp. Data Recorder	MHB-382SD	N/A	MT23-4860	Jul 25, 2024
Digital Thermometer	EFT-4	EFT42020033	MT23-3227	May 01, 2024

This result of calibration was found accurate as shown on date and place of calibration only.
Traceability : This measurement are traceable to the International System of Unit (SI), through National Institute of Metrology Thailand (NIMT)

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

INCTECH METROLOGICAL CENTER CO.,LTD. CALIBRATION LABORATORY IMC

Calibrated by : Miss Nuengruethai Siripoch
Issue date : Nov 22, 2023

Approved by : (Mr.Panuwat Phuklan)

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

บริษัท เมชโคเทค จำกัด
MESHCOTECH CO.,LTD.

Detector MS Signal to Noise Test

Customer Name: **Health & Envitech Co.,Ltd.**
Department: **Analytical Lab**
System ID: **IC-01**
Manufacturer: **Dionex**
Serial No: **07090143**
Report Expiry Date: **Sep 08,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **SOP V5-GS.v5r0 HPLC**
Model: **ICS-1000**
Lot Number: **201006**
Traceable To: **060254**

The result reference to raw data on page: 29

	Actual Reading	Signal to Noise
Standard Response /	18.141480	1287.542938
Noise Response at 11-15 Minute	0.014090	

Acception criteria
Signal to Noise ≥ 50
Evaluate Result **Pass**

Qualifier's signature: Phanmet Phangchat Date: 08/09/2023

Authorised's signature: Date: 08/09/2023

PQR

82, Moo.18, Buengkamproi, Lamlukka,Pathum thani, Thailand 12150
Tel. (6698)970 7090 , Fax.(662)560 2541
PQR-STN

น.16/31

analytikjena
An Endress+Hauser Company

Maintenance Protocol

PlasmaQuant PQ 9000 (Elite)
ICP-OES

Inctech Metrological Center Co.Ltd.
39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, Thailand
Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com

Result : Without adjustment
Calibration Point : 50, 90, 100, 110 ml

Nominal value (ml)	Standard reading (ml)	UUC* correction (ml)	Uncertainty of measurement (+/- ml)
50	50.0192	0.0192	0.056
90	90.0227	0.0227	0.063
100	100.0279	0.0279	0.063
110	110.0287	0.0287	0.073

UUC* = Unit under calibration

-oOo-

Analytik Jena AG
Konrad-Zuse-Strasse 1
07745 Jena · Germany

Phone +49 3641 77 77 70
info@analytik-jena.com
www.analytik-jena.de

1 Customer and service data

Customer address

Company	บ.เฮลธ์ แอนด์ เอ็นไวเทค จำกัด
Department	QC
Address (street, number, zip code, city)	6 ซอยงามวงศ์วาน 5 ต.บางเขน อ.เมือง จ.นนทบุรี 11000
Phone	
E-mail	
Customer number	
Order number	

Device data (model and serial number)

ICP OES	PQ9000
Mobile cooling unit	PolyScience
Autosampler	-

Analytik Jena representative information

Name	Mr.Pukitja somton
Company	Analytik Jena Instrument Thailand

Maintenance date

Date	11 October 2023

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1 Customer and service data 3
2 Maintenance with subsequent Operational Qualification (OQ) 4
3 Maintenance work on the base unit 5
4 Maintenance work on accessories 8
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5.2 Check of safety circuits 10
5.3 Check of neon energy 11
5.4 Adjustment of transfer optics (Mn 257.610 nm) 11
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3 Maintenance work on the base unit

Update firmware and software

		Complies	Does not comply
Save device parameters and neon table		☑	☐
Check the firmware version and FPGA		☑	☐
Check the version of the ASpect PQ software		☑	☐
Update software, FPGA and firmware Approval for firmware and software updates was given by the customer.		☑	☐
The customer's was informed that the Operational Qualification (OQ) and software validation may have to be repeated for validated systems after a firmware/software update.		☑	☐
Update ASpect PQ		☑	☐
▪ Current version	1.2.3.0		
▪ Version after update	–		
Update FPGA		☑	☐
▪ Current version	h09; h00		
▪ Version after update	–		
Updating the firmware		☑	☐
▪ Current version	1.36		
▪ Version after update	–		
Record running time (in hours)		☑	☐
▪ Base unit	3339		
▪ RF generator	1949		

Service the rear of the device

	Complies	Does not comply
Replace the air filter mat	☑	☐

2 Maintenance with subsequent Operational Qualification (OQ)

- If an Operational Qualification (OQ) is carried out after maintenance, there is no need to check analytical parameters in the maintenance report.
- The analytical parameters are then checked in the separate OQ report.

	Yes	No
Maintenance with subsequent Operational Qualification (OQ)	☐	☑

14.16/34

Comments:

Service the spectrometer

	Complies	Does not comply
Clean and lubricate the spindle of the prism and grating with a little oil	☑	☐

Check gas flows at the gas box

Gas flow	Rated value	Actual value	Complies	Does not comply
Nebulizer gas flow	0.5 L/min ± 15 %	0.493	☑	☐
Auxiliary gas flow	0.5 L/min ± 15 %	0.496	☑	☐
Cone gas flow	1,7 ... 2,8 L/min	2.7	☑	☐
Oxygen is used (optional)			☐	☐
Oxygen flow	00.5 L/min ± 15 %	-	☐	☐

Comments:

Service the sample introduction system

	Complies	Does not comply
Remove, disassemble and clean the torch ■ Check the surface of the glass parts (injector, inner tube, outer tube and glass holder) for damage, heavily coated and broken parts. Replace glass parts, if necessary ■ Clean glass parts in aqua regia	☑	☐
Check the sealing rings, replace if necessary ■ Sealing rings in torch holder (3 pieces) and torch shuttle (2 pieces) ■ Sealing rings in injector and mixing chamber mount (Check sealing rings for porous and hardened areas, replace if necessary)	☑	☐
Check pump tubing (sample, waste), replace if necessary	☑	☐
Check peristaltic pump, disassemble and lubricate if necessary	☑	☐
Check the nebulizer for damage and clean it	☑	☐
Remove and clean the mixing chamber	☑	☐
Check the sealing ring of the mixing chamber	☑	☐
Check and clean torch height adjustment drive	☑	☐
Lubricate the linear drive with a little oil	☑	☐
Check the igniting pin for signs of wear	☑	☐

Comments:

Service the plasma compartment

	Complies	Does not comply
Disassemble the cone, check geometry and clean it if necessary Take out the windows (axial/radial) and clean or replace them Replacing the sealing rings	☑	☐
Check the surface of the first mirror, clean or replace it if necessary	☑	☐
Check the air outlet for deposits and blockages, clean it if necessary	☑	☐
Remove the cover plate below the plasma compartment and clean it Renew the filter mat	☑	☐
Check the coil for its material condition, position, geometry and for the tightness of connections	☑	☐
Clean or replace bonnet	☑	☐
Check RF deflector spring, replace it if necessary	☑	☐

14.16/35

	Complies	Does not comply
Check the functionality of the washing cup	☑	☐
Check the hose connections for leaks	☑	☐

4 Maintenance work on accessories

Service the mobile cooling unit

		Complies	Does not comply
Vacuum or clean the condenser		☑	☐
Record the condition of the cooling water before maintenance:		☑	☐
Particles and discoloration present:	☐ yes ☑ No		
cooling water flow rate	1.50		
Cooling water primary pressure	49 psi		
Conductivity of the cooling water	120		
Clean the water filter on the base unit (if filter is installed)		☑	☐
Renew cooling water ■ Prepare cooling water according to Analytik Jena's specifications ■ Use cooling water additive from Analytik Jena		☑	☐
Check filling level of cooling water, top up if required		☑	☐

Cooling water circuit after maintenance

	Rated value	Actual value	Complies	Does not comply
cooling water flow rate	1.5 to 2.0 L/min	1.50	☑	☐
Cooling water primary pressure	max. 6 bar (85 psi)	55 psi	☑	☐
Conductivity of the cooling water	50 to 200 µS/cm	100	☑	☐
Cooling water temperature (in mobile cooling unit)	18 °C	18	☑	☐

Service the autosampler

	Complies	Does not comply
Check cannula and tubing to the base unit	☑	☐
Check pump tubing (washing solution, waste), replace if necessary	☑	☐
Clean the covers, rack mount and accessories	☑	☐
Check the condition of the toothed belts for cracks, gaps and changes in color	☑	☐
Check the peristaltic pump for smooth operation	☑	☐

µ.16/36

5.3 Check of neon energy

The plasma must be ignited for this test (CCD cooling active).

	Rated value (Steps)	Actual value (Steps)	Complies	Does not comply
585.2462 nm	> 4000 ct/s	30337	☑	☐
594.4807 nm	> 3000 ct/s	11135	☑	☐
640.2217 nm	> 3000 ct/s	4286	☑	☐
849.5322 nm	> 3000 ct/s	3653	☑	☐
607.4311 nm	> 3000 ct/s	26711	☑	☐
659.8923 nm	> 3000 ct/s	21792	☑	☐
743.8864 nm	> 3000 ct/s	32092	☑	☐
703.2381 nm	> 10000 ct/s	19529	☑	☐

Comments:

—

5.4 Adjustment of transfer optics (Mn 257.610 nm)

Adjust detection (axial)		Complies	Does not comply
X offset	-0.6	☑	☐
Y offset	-2.1	☑	☐

5 Checking basic functions and device parameters

5.1 Check of correction functions

	Rated value (Steps)	Actual value (Steps)	Complies	Does not comply
As (193.6950 nm)	± 500	143	☑	☐
Cu (324.7540 nm)	± 500	98	☑	☐
Na (588.9953 nm)	± 500	75	☑	☐
K (766.4908 nm)	± 500	89	☑	☐

Comments:

-

5.2 Check of safety circuits

	Complies	Does not comply
Safety circuit for torch position	☑	☐
Safety circuit for door of plasma compartment	☑	☐
Safety circuit for interrupted cooling water flow (cooling water flow < 0.85 L/min)	☑	☐
Safety circuit for suction power (check the setting Par[85])	☑	☐
Value Par[85]: 4115		
Safety circuit for argon inlet pressure (p < 4 bar)* * if sensor is installed (Par[116] = 1)	—	☐

Comments:

-

14.16/37

Line	Peak position before correction	Peak position after correction	Difference Rated value	Difference Actual value
Zn 213.8560 nm	181.0 ± 2.1	181.0 ± 1.6	± 1.0	0.5
Mn (257.6100 nm)	181.0 ± -0.3	181.0 ± -0.3	± 1.0	0.0
Cu (324.7540 nm)	181.0 ± -0.2	181.0 ± -0.1	± 1.0	-0.1
Li 670.7910 nm	181.0 ± -2.5	181.0 ± -3.5	± 1.0	1.0

Comments:

Robustness factor

Calculation according to the following formula:

$$F_r = \frac{\text{intensity } Mg_{280.271} \,/\, \text{intensity } BG\,Mg_{280.271}}{\text{intensity } Mg_{285.213} \,/\, \text{intensity } BG\,Mg_{285.213}}$$

Intensity / calculated factor	Value
Intensity Mg 280.271	1538110
Intensity BG Mg 280.271	8481
Intensity Mg 285.213	175650
Intensity BG Mg 285.213	8437
F_r	8.71

Comments:

Adjust detection (axial)		Complies	Does not comply
Intensity value	2420277	☑	☐

Adjust detection (radial)		Complies	Does not comply
X offset	14.7	☑	☐
Y offset	-0.7	☑	☐
Intensity value	395776	☑	☐

Comments:

5.5 Verification of the wavelength accuracy, generator robustness and analytical performance

- Requirements
  - Start ASpect PQ
  - Perform measurements with the standard sample introduction kit
  - Load the sequence "maintenance_PQ9000"
  - Plasma burn-in time 15 min
  - 1 mg/L multi-element solution (Merck standard IV for ICP) in 3 % HNO_3
  - Plasma conditions 12 L/min plasma gas, 0.5 L/min auxiliary gas, 0.6 L/min nebulizer gas
  - Plasma power 1200 W
  - Measurement time 10 s
- Start the sequence "maintenance_PQ9000" (duration approx. 40 min).
  The sequence automatically loads the methods that are necessary to determine the data.

Wavelength accuracy

- Open the spectra display of the measured lines one after the other. Read off the peak position (peak position before correction). Carry out the peak correction by clicking on **[Find peak center]** and read off the peak position again (peak position after correction). Calculate the difference between the two values (peak position before correction - peak position after correction).

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		Rated value	Actual value
	Relative standard deviation (RSD) [%]	< 2	0.23
Mn (257.6100 nm)	Limit of detection LOD [mg/L]	< 0.0004	0.000045
	Recovery [%]	100 ± 10	101.5
	Relative standard deviation (RSD) [%]	< 1.5	0.42
Cu (324.7540 nm)	Limit of detection LOD [mg/L]	< 0.0015	0.000403
	Recovery [%]	100 ± 10	101.1
	Relative standard deviation (RSD) [%]	< 1.5	0.29
Li 670.7910 nm	Limit of detection LOD [mg/L]	< 0.003	0.00037
	Recovery [%]	100 ± 10	101.9
	Relative standard deviation (RSD) [%]	< 1.5	0.52

Comments:

–

Analytical performance

☑ PlasmaQuant PQ 9000 Elite

		Rated value	Actual value
Zn 213.8560 nm	Limit of detection LOD [mg/L]	< 0.0015	–
	Recovery [%]	100 ± 10	–
	Relative standard deviation (RSD) [%]	< 2	–
Mn (257.6100 nm)	Limit of detection LOD [mg/L]	< 0.0002	–
	Recovery [%]	100 ± 10	–
	Relative standard deviation (RSD) [%]	< 1.5	–
Cu (324.7540 nm)	Limit of detection LOD [mg/L]	< 0.0010	–
	Recovery [%]	100 ± 10	–
	Relative standard deviation (RSD) [%]	< 1.5	–
Li 670.7910 nm	Limit of detection LOD [mg/L]	< 0.0025	–
	Recovery [%]	100 ± 10	–
	Relative standard deviation (RSD) [%]	< 1.5	–

☑ PlasmaQuant PQ 9000

		Rated value	Actual value
Zn 213.8560 nm	Limit of detection LOD [mg/L]	<0.002	0.000198
	Recovery [%]	100 ± 10	98.8

14.16/39

6 Comments and objections

Comments and possible objections raised during installation and commissioning are to be recorded in writing in this section.

–

7 Completing maintenance

	Complies	Does not comply
Maintenance on the analyzer has been completed.	☑	☐
The functionality and analytical performance of the device was checked in the presence of the user. The device meets its technical specification.	☑	☐

Name	Function	Date	Signature
Wipawan pathumwan	Representative Customer	11/10/2023	
Mr.Pukitja Somton	Representative Analytik Jena AG	11/10/2023	

14.16/40

Calibration Results:

Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 1.5 nm and UUC at 1.4 nm

Standard Wavelength	Unit Under Calibration	Correction	Uncertainty
360.93	360.90	0.03	0.13
418.59	418.58	0.01	0.13
460.02	460.00	0.02	0.13
536.59	536.60	-0.01	0.13
684.40	684.66	-0.26	0.13

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.0000	0.0000	0.0045
	0.5772	0.5771	0.0001	0.0045
	0.7198	0.7192	0.0006	0.0045
	1.0394	1.0397	-0.0003	0.0045
440 nm	0.0000	0.0000	0.0000	0.0045
	0.5608	0.5604	0.0004	0.0045
	0.7062	0.7051	0.0011	0.0045
	1.0189	1.0183	0.0006	0.0045
465 nm	0.0000	0.0000	0.0000	0.0045
	0.5214	0.5209	0.0005	0.0045
	0.6652	0.6641	0.0011	0.0045
	0.9577	0.9570	0.0007	0.0045
546.1 nm	0.0000	0.0000	0.0000	0.0045
	0.5192	0.5182	0.0010	0.0045
	0.6907	0.6891	0.0016	0.0045
	0.9949	0.9932	0.0017	0.0045
590 nm	0.0000	0.0000	0.0000	0.0045
	0.5530	0.5517	0.0013	0.0045
	0.7555	0.7534	0.0021	0.0045
	1.0761	1.0740	0.0021	0.0045
635 nm	0.0000	0.0000	0.0000	0.0045
	0.5604	0.5591	0.0013	0.0045
	0.7418	0.7398	0.0020	0.0045
	1.0467	1.0448	0.0019	0.0045

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

น.16/41

Certificate of Calibration

Equipment:	SPECTROPHOTOMETER	Certificate No.:	C06240172
Model:	SPECORD 50 PLUS	Issued Date:	03 May 2024
Serial No. (or ID.):	232H1012 (LB-HE-073)	Job No.:	WO-00025963
Manufacturer:	Analytik jena	Page:	1 of 3
Condition:	In Condition		

Customer: Health & Envitech Co.,Ltd.
6 Ngamwongwan Soi 5,
Tumbon Bangkhen, Mueangnontaburi, Nontaburi 11000 Thailand

Environment Condition: Temperature 25.8 °C ± 0.6 °C
Humidity 57.5 %RH ± 2.5 %RH

Calibration Place: Health & Envitech Co.,Ltd. (Lab ชั้น 2)
6 Ngamwongwan Soi 5,
Tumbon Bangkhen, Mueangnontaburi, Nontaburi 11000 Thailand

Calibration By: Mr.Siwapan Srijan

Calibration Date: 03 May 2024

The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04

Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.

The standard for Wavelength Certificate No. 118106 and 118118
The standard for Photometric Certificate No. 118123 and 118113
The standard for Stray light Certificate No. 118110 and 118112
The standard for Spectral resolution Certificate No. 118104

(Mr. Siwapan Srijan)
Person in charge

(Mr. Nitinun Srihawan)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth – in Asia and Beyond.

CAL-FM-C06-16: 11 Mar 2024

VCR No. GC-0623-055

Validation Calibration Report

Customer Name: Health & Envitech Co.,Ltd

Department: LAB Analytical

Present By: Meshcotech Co., Ltd.

Instrument System ID: LB-HE-069

Instrument List in System

Name and Model	Serial Number	Manufacturer
Clarus 500 GC	650N6091604	Perkin Elmer

This report confirms that the above instrument has been calibrated.

The actual measurement results are stated on the inside of Validation Calibration Report.

Qualifier's signature / Date 1/6/2023

(Mr. Prasittisent Maliphan)

Acceptor's signature / Date

(Ms. Wathu Krongsut)

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DKSH

Certificate No.: C06240172 Page 3 of 3

Calibration Results:

Without Adjustment

Photometric Accuracy (Absorbance)

Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
235 nm	0.0000	0.0000	0.0000	0.0080
	0.7533	0.7485	0.0048	0.0080
257 nm	0.0000	0.0000	0.0000	0.0080
	0.8745	0.8703	0.0042	0.0080
313 nm	0.0000	0.0000	0.0000	0.0080
	0.2926	0.2927	-0.0001	0.0080
350 nm	0.0000	0.0000	0.0000	0.0080
	0.6486	0.6456	0.0030	0.0080

Stray light *

Standard: cut-off	UUC: Wavelength (nm)	UUC: Transmission (%T)	Absorbance (A)
260.95 +/- 0.11 nm	260.96	0.76	2.1192
392.04 +/- 0.11 nm	392.04	1.13	1.9469

Spectral Resolution *

Nominal Concentration 0.02 % v/v	Peak	Trough	Ratio	SBW
Standard Wavelength (nm)	268.74	266.81	1.45	2.00
UUC: Wavelength (nm)	268.83	266.86		
Std Absorbance (A)	0.5137	0.3473		
UUC: Absorbance (A)	0.4958	0.3410		

* Calibration Marked " Not TISI Accredited " in this Certificate have been included for completeness.

The End of Certificate

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth – in Asia and Beyond.

Inlet Pressure Accuracy Result

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Serial No: **650N6091604**
Standard Batch: **N/A**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **VKIT.GC.FLOW**
Model: **Clarus 500 GC**
Detector Type: **FID**
Traceable To: **3186-GFM**
System ID: **LB-HE-069**
Gas Type: **He**

The result reference to raw data on page: 1

Setpoint Inlet Pressure PSI.	Observed Inlet Pressure PSI.	Deviation Inlet pressure. % Error
5.00	4.80	4.00
10.00	9.90	1.00
20.00	20.20	1.00
30.00	30.60	2.00
40.00	41.00	2.50

Acception criteria of absolute deviation ≤ 5%.
Evaluate Result **PASS**

Qualifier's signature: Date: 1/6/2023
Authorised by: Date: 1/6/2023

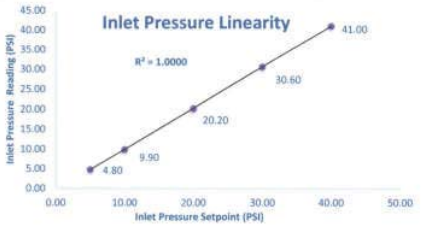
Inlet Pressure Linearity Result

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Serial No: **650N6091604**
Standard Batch: **N/A**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **VKIT.GC.FLOW**
Model: **Clarus 500 GC**
Detector Type: **FID**
Traceable To: **4075-GSM**
System ID: **LB-HE-069**
Gas Type **He**

The result reference to raw data on page: 1

Inlet pressure Setpoint (PSI)	Inlet pressure (PSI) Reading
5.00	4.80
10.00	9.90
20.00	20.20
30.00	30.60
40.00	41.00
R-Square	1.0000



Acception criteria of R^2 > 0.9990
Evaluate Result **PASS**

Qualifier's signature: Date: 1/6/2023
Authorised by: Date: 1/6/2023

Detector Gas Flow Rate Accuracy Result

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Serial No: **650N6091604**
Standard Batch: **N/A**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **VKIT.GC.FLOW**
Model: **Clarus 500 GC**
Detector Type: **FID**
Traceable To: **4075-GSM**
System ID: **LB-HE-069**
Gas Type: **H2**

The result reference to raw data on page: 2

Setpoint Flow Rate ml/min.	Observed Flow Rate ml/min.	Deviation ml/min. % Error
20.00	21.00	5.00
30.00	31.00	3.33
40.00	40.80	2.00
50.00	50.80	1.60
60.00	61.50	2.50

Acception criteria of absolute deviation ≤ 5%.
Evaluate Result **PASS**

Qualifier's signature: Date: 1/6/2023
Authorised by: Date: 1/6/2023

Detector Gas Flow Rate Accuracy Result

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Serial No: **650N6091604**
Standard Batch: **N/A**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **VKIT.GC.FLOW**
Model: **Clarus 500 GC**
Detector Type: **FID**
Traceable To: **4075-GSM**
System ID: **LB-HE-069**
Gas Type: **Air**

The result reference to raw data on page: 3

Setpoint Flow Rate ml/min.	Observed Flow Rate ml/min.	Deviation ml/min. % Error
100.00	100.00	0.00
200.00	194.30	2.85
300.00	293.80	2.07
400.00	397.40	0.65
500.00	497.40	0.52

Acception criteria of absolute deviation ≤ 5%.
Evaluate Result **PASS**

Qualifier's signature: Date: 1/6/2023
Authorised by: Date: 1/6/2023

GC Column OvenTemperature Performance Result

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Serial No: **650N6091604**
Standard Batch: **N/A**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **VKIT.GC.TEMPACC**
Model: **Clarus 500 GC**
Detector Type: **FID**
Traceable To: **4077-DTM**
System ID: **LB-HE-069**

The result reference to raw data on page: 4

Setpoint Temperature (°C)	Collected 1 Temperature (°C)	Collected 2 Temperature (°C)	Collected 3 Temperature (°C)	Collected 4 Temperature (°C)	Collected 5 Temperature (°C)	Average Temperature (°C)	Deviation of Accuracy Absolute/°C. (Set Temp-Average Temp)
40.0	39.5	39.5	39.6	39.6	39.6	39.6	0.44
100.0	99.5	99.7	99.7	99.8	99.7	99.7	0.32
150.0	149.8	150.0	150.0	150.1	150.1	150.0	0.00
200.0	199.7	199.8	199.9	199.8	199.9	199.8	0.18
280.0	279.8	279.9	280.1	280.1	280.1	280.0	0.00

Acception criteria ≤ 1 °C.
of absolute deviation Accuracy

Evaluate Result **PASS**

Qualifier's signature: Date: 1/6/2023
Authorised by: Date: 1/6/2023

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Tel. (6698)970-7090, Fax.(662)540-2541 Email: sales.meshcotect@gmail.com

GC Column OvenTemperature Stability Performance Result

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Serial No: **650N6091604**
Standard Batch: **N/A**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **VKIT.GC.TEMPACC**
Model: **Clarus 500 GC**
Detector Type: **FID**
Traceable To: **4077-DTM**
System ID: **LB-HE-069**

The result reference to raw data on page: 5

Setpoint Temperature (°C)	Collected Point1 Temperature (°C)	Collected Point2 Temperature (°C)	Collected Point3 Temperature (°C)	Collected Point4 Temperature (°C)	Collected Point5 Temperature (°C)	Average Temperature (°C)	STDEV Temperature (°C)
100.0	99.5	99.7	99.7	99.8	99.7	99.68	0.11

Acception criteria ≤ 0.5 °C.
of absolute deviation Stability

Evaluate Result **PASS**

Qualifier's signature: Date: 1/6/2023
Authorised by: Date: 1/6/2023

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Tel. (6698)970-7090, Fax.(662)540-2541 Email: sales.meshcotect@gmail.com

GC Injector Temperature Performance Result

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Serial No: **650N6091604**
Standard Batch: **N/A**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **VKIT.GC.TEMPACC**
Model: **Clarus 500 GC**
Detector Type: **FID**
Traceable To: **4077-DTM**
System ID: **LB-HE-069**

The result reference to raw data on page: 6

Setpoint Temperature (°C)	Collected Temperature (°C)	Deviation of Accuracy Absolute/°C. (Set Temp-Average Temp)
150.0	147.4	2.6
200.0	196.4	3.6
250.0	245.4	4.6

Acception criteria ≤ 10 °C.
of absolute deviation Accuracy
Evaluate Result **PASS**

Qualifier's signature: Date: 1/6/2023
Authorised by: Date: 1/6/2023

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Tel. (6698)970-7090, Fax.(662)540-2541 Email: sales.meshcotect@gmail.com

GC Base Detector Temperature Performance Result

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Serial No: **650N6091604**
Standard Batch: **N/A**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **VKIT.GC.TEMPACC**
Model: **Clarus 500 GC**
Detector Type: **FID**
Traceable To: **4077-DTM**
System ID: **LB-HE-069**

The result reference to raw data on page: 7

Setpoint Temperature (°C)	Collected Temperature (°C)	Deviation of Accuracy Absolute/°C. (Set Temp-Average Temp)
250.0	245.5	4.50
300.0	296.4	3.60

Acception criteria ≤ 10 °C.
of absolute deviation Accuracy

Evaluate Result **PASS**

Qualifier's signature: Date: 1/6/2023
Authorised by: Date: 1/6/2023

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Tel. (6698)970-7090, Fax.(662)540-2541 Email: sales.meshcotect@gmail.com

GC Injections Carry Over Result

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Serial No: **650N6091604**
Standard Batch: **177-FID**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **VKIT.GC.LINPRC**
Model: **Clarus 500 GC**
Detector Type: **FID**
Traceable To: **177-FID**
System ID: **LB-HE-069**

The result reference to raw data on page: 8-10

Injections	Peak Retention Time	Area
Carry Over Blank1	-	0.000
Standard 0.08% Tetradecane	1.461	1131130.47
Carry Over Blank2	-	0.000
%Carry Over		0.000

Acception criteria of %Carry Ove ≤ 0.01%

Evaluate Result **PASS**

Qualifier's signature: Date: 1/6/2023

Authorised by: Date: 1/6/2023

GC Injections Area Precision Result

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Serial No: **650N6091604**
Standard Batch: **177-FID**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **VKIT.GC.LINPRC**
Model: **Clarus 500 GC**
Detector Type: **FID**
Traceable To: **177-FID**
System ID: **LB-HE-069**

The result reference to raw data on page: 11-16

Number of Injections	Retention Time	Area Peak Number 2
Precision 1 0.08% Tetradecane	1.461	1146805.50
Precision 2 0.08% Tetradecane	1.462	1142966.78
Precision 3 0.08% Tetradecane	1.460	1131811.87
Precision 4 0.08% Tetradecane	1.463	1159745.44
Precision 5 0.08% Tetradecane	1.461	1158710.81
Precision 6 0.08% Tetradecane	1.461	1150475.11
Average 0.08% Tetradecane		1148419.25
STDEV		10455.28
%RSD		0.91

Acception criteria of Precision (%RSD) ≤ 1%

Evaluate Result **PASS**

Qualifier's signature: Date: 1/6/2023

Authorised by: Date: 1/6/2023

GC Injections Retention Precision Result

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Serial No: **650N6091604**
Standard Batch: **177-FID**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **VKIT.GC.LINPRC**
Model: **Clarus 500 GC**
Detector Type: **FID**
Traceable To: **177-FID**
System ID: **LB-HE-069**

The result reference to raw data on page: 11-16

Number of Injections	Peak Retention time Peak Number 2
Precision 1 0.08% Tetradecane	1.461
Precision 2 0.08% Tetradecane	1.462
Precision 3 0.08% Tetradecane	1.460
Precision 4 0.08% Tetradecane	1.463
Precision 5 0.08% Tetradecane	1.461
Precision 6 0.08% Tetradecane	1.461
Average	1.461
STDEV	0.001
%RSD	0.07

Acception criteria of Peak Retention (%RSD) ≤ 0.5%

Evaluate Result **PASS**

Qualifier's signature: Date: 1/6/2023

Authorised by: Date: 1/6/2023

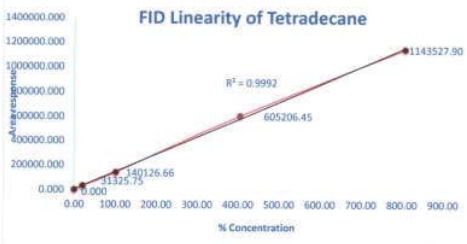
FID Lineaity Result

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Serial No: **650N6091604**
Standard Batch: **N/A**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **VKIT.GC.LINPRC**
Model: **Clarus 500 GC**
Detector Type: **FID**
Traceable To: **177-FID**
System ID: **LB-HE-069**

The result reference to raw data on page: 17-21

Injection	Tetradecane concentration (µg/ml)	Area
Linearity 1 0.000% Tetradecane	0.00	0.000
Linearity 2 0.002% Tetradecane	20.30	31325.75
Linearity 3 0.010% Tetradecane	101.40	140126.66
Linearity 4 0.040% Tetradecane	404.60	605206.45
Linearity 5 0.080% Tetradecane	807.10	1143527.90
R-Square		0.9992



Acception criteria of Linearity (R^2) >0.9990

Evaluate Result **PASS**

Qualifier's signature: Date: 1/6/2023

Authorised by: Date: 1/6/2023

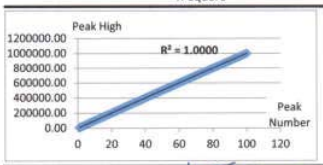
Data System Linearity of Detection Check

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Version: **6.3**
Standard Batch: **N/A**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **Validator Method**
Model: **TotalChrom**
Detector Type: **FID**
Traceable To: **Validator ™**
System ID: **LB-HE-069**

The result reference to raw data on page: 22-24

Peak Number#	Peak High (uVolt)	Peak Number#	Peak High (uVolt)	Peak Number#	Peak High (uVolt)	Peak Number#	Peak High (uVolt)
1	10002.00	26	260002.43	51	509996.49	76	759996.98
2	20003.00	27	270002.06	52	519993.03	77	769993.79
3	30004.00	28	281599.30	53	529994.64	78	780631.83
4	40004.00	29	290001.64	54	539997.42	79	789994.06
5	50004.53	30	300003.60	55	549996.61	80	799996.06
6	60006.00	31	310002.06	56	559996.06	81	809994.61
7	70005.00	32	320005.98	57	569994.06	82	819996.97
8	80003.00	33	330004.52	58	579991.43	83	829996.57
9	90004.06	34	340005.72	59	589993.16	84	839996.61
10	100006.38	35	350005.35	60	599994.14	85	849995.05
11	110004.48	36	360003.49	61	609991.62	86	859996.12
12	120004.00	37	370003.06	62	619995.56	87	869995.92
13	130005.06	38	380005.12	63	629990.37	88	879994.61
14	140006.36	39	390002.44	64	639993.06	89	889995.06
15	150004.44	40	400000.84	65	649994.62	90	899994.59
16	160005.06	41	410003.61	66	659993.58	91	909996.23
17	170004.67	42	420001.49	67	669990.49	92	919995.29
18	180004.49	43	429999.68	68	679996.01	93	929995.41
19	190006.49	44	440000.06	69	689994.78	94	939994.44
20	200005.14	45	449998.44	70	699993.99	95	949993.25
21	210002.03	46	459996.88	71	709992.6	96	959996.12
22	220004.44	47	469999.06	72	719992.75	97	969992.63
23	230003.37	48	479996.98	73	729996.12	98	979995.09
24	240003.12	49	489994.06	74	739995.6	99	989993.96
25	250002.84	50	499996.99	75	749995.66	100	999993.66
	R-Square				1.0000		



Linearity Correlation Calculated
Acception criteria of R^2 ≥0.9960

Evaluate Result **PASS**

Qualifier's signature:
Date: 1/6/2023

Authorised by:
Date: 1/6/2023

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Data System Precision of Detection Check

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Version: **6.3**
Standard Batch: **N/A**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **Validator Method**
Model: **TotalChrom**
Detector Type: **FID**
Traceable To: **Validator ™**
System ID: **LB-HE-069**

The result reference to raw data on page: 22-36

Collected 3 Peak Data 4-1		Collected 3 Peak Data 4-2		Collected 3 Peak Data 4-3		Collected 3 Peak Data 4-4		Collected 3 Peak Data 4-5	
Peak Number#	Peak High (uVolt)	Peak Number#	Peak High (uVolt)	Peak Number#	Peak High (uVolt)	Peak Number#	Peak High (uVolt)	Peak Number#	Peak High (uVolt)
1	10002.000	1	10002.120	1	10003.000	1	10001.000	1	10005.560
50	499996.990	50	499986.060	50	499995.890	50	499996.120	50	499974.610
100	999993.660	100	999979.490	100	999996.270	100	999996.540	100	999952.560

%RSD at peak Number 1 = 0.02
%RSD at peak Number 50 = 0.00
%RSD at peak Number 100 = 0.00

Acception criteria of Precision deviation %RSD ≤ 0.5

Evaluate Result **PASS**

Qualifier's signature:
Date: 1/6/2023

Authorised by:
Date: 1/6/2023

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Data System Number of Detection Check

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Version: **6.3**
Standard Batch: **N/A**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **Validator Method**
Model: **TotalChrom**
Detector Type: **FID**
Traceable To: **Validator ™**
System ID: **LB-HE-069**

The result reference to raw data on page: 37-38

Peak Count# Peak Detected Specify	Peak count Detected
≥ 32 Peak Number	43 Peak Number

Acception criteria of absolute deviation ≥ 32 Peak

Evaluate Result **PASS**

Qualifier's signature:
Date: 1/6/2023

Authorised by:
Date: 1/6/2023

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Tel. (6698)970-7090, Fax.(662)540-2541 Email: sales.meshcotect@gmail.com

Data System Square Peak High Check

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Version: **6.3**
Standard Batch: **N/A**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **Validator Method**
Model: **TotalChrom**
Detector Type: **FID**
Traceable To: **Validator ™**
System ID: **LB-HE-069**

The result reference to raw data on page: 39

Peak Number# Peak Detection Specify	Peak high /1000 Collected (millivolt)	%deviation	Evaluate Result
1 500 millivolt	499.992	0.00	PASS
2 1000 millivolt	999.999	0.00	PASS

Acception criteria of % deviation ≤1%

Evaluate Result **PASS**

Qualifier's signature:
Date: 1/6/2023

Authorised by:
Date: 1/6/2023

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Tel. (6698)970-7090, Fax.(662)540-2541 Email: sales.meshcotect@gmail.com

Data System Retention Time Reproduced Check

Customer: **Health & Envitech Co.,Ltd.**
Department: **LAB Analytical**
Manufacturer: **PERKIN ELMER**
Version: **6.3**
Standard Batch: **N/A**
Expiry Date: **June 01,2024**

Qualifier: **Meshcotech Co., Ltd.**
Procedure: **Validator Method**
Model: **TotalChrom**
Detector Type: **FID**
Traceable To: **Validator ™**
System ID: **LB-HE-069**

The result reference to raw data on page: 40

Peak Number#	Retention Time Apex	Previuos peak-Curent peak Absulute time /min.	Evaluate Result
1	**0.476**	N/A	
2	**1.897**	**1.421**	**PASS**
3	**3.318**	**1.421**	**PASS**
4	**4.738**	**1.420**	**PASS**
5	**6.159**	**1.421**	**PASS**
6	**7.580**	**1.421**	**PASS**
		Acception criteria of absolute deviation	1.41-1.43 Minute
		Evaluate Result	**PASS**

Qualifier's signature:

Date: 1/6/2023

Authorised by:

Date: 1/6/2023

VCR
82 Moo.18, Buengkamproi, Lamlukka,Pathum thani, Thailand 12150
Tel. (6698)970-7090, Fax.(662)540-2541 Email: sales.meshcotect@gmail.com

ที่ อก ๐๓๒๒/๑๗๔๖๕

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๘ ธ.ค. ๒๕๖๖

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เช้าเทิร์นไทยคอนซัลติ้ง จำกัด

อ้างถึง คำขอต่ออายุของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๑๐ พฤศจิกายน ๒๕๖๖

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เช้าเทิร์นไทยคอนซัลติ้ง จำกัด จำนวน ๑ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เช้าเทิร์นไทยคอนซัลติ้ง จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๑๗๖ สถานที่ตั้ง เลขที่ ๕๙/๔๕ หมู่ที่ ๕ ตำบลศรีสุนทร อำเภอถลาง จังหวัดภูเก็ต ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เช้าเทิร์นไทยคอนซัลติ้ง จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์

๑) [redacted]
๒)
๓)
๔)

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์

๑) [redacted]
๒)
๓)
๔)
๕)
๖)
๗)
๘)

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย ตามสิ่งที่ส่งมาด้วย

COPY

หนังสือ....

หนังสือฉบับนี้จะหมดอายุในวันที่ ๑ ธันวาคม ๒๕๖๙ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

[redacted]

ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคใต้
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

COPY

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคใต้
โทร. ๐ ๗๔๓๒ ๕๐๒๙, ๐ ๗๔๘๙ ๐๖๓๔ ต่อ ๕๒๐๑
ไปรษณีย์อิเล็กทรอนิกส์ sirw@diw.mail.go.th

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เซ้าเทิร์นไทยคอนซัลติ้ง จำกัด เลขทะเบียน ว-๑๗๖
ที่ อก ๐๓๒๒/ ลงวันที่

ขอบข่ายสารมลพิษที่ได้รับการขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๙ รายการ

น้ำเสีย จำนวน 9 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Biochemical Oxygen Demand	5-Day BOD Test, Azide Modification Method
2	Chemical Oxygen Demand	Closed Reflux, Titrimetric Method
3	Oil & Grease	Liquid-Liquid, Partition-Gravimetric Method
4	pH	Electrometric Method
5	Sulfide	Iodometric Method
6	Temperature	Laboratory and Field Method
7	Total Dissolved Solids	Dried at 180 °C
8	Total Kjeldahl Nitrogen	Macro-Kjeldahl, Titrimetric Method
9	Total Suspended Solids	Dried at 103-105 °C

เอกสารอ้างอิง

APHA, AWWA, WEF. Standard Methods for the Examination of Water and Wastewater. 24th ed. Washington, DC: APHA, 2023.

COPY

[redacted]

ที่ อก ๐๓๒๐/๑๑๓๔๒

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ แขวงทุ่งพญาไท
เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๒๗ กรกฎาคม ๒๕๖๖

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด

อ้างถึง คำขอต่ออายุของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๗ มิถุนายน ๒๕๖๖

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

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

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

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

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

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

[redacted]

COPY

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก
โทร. ๐ ๓๓๑๓ ๖๐๕๙ ต่อ ๕๐๐๑-๒
ไปรษณีย์อิเล็กทรอนิกส์ eirw@diw.mail.go.th

"อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว"

น.16/51

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด เลขทะเบียน ว-๐๐๓
ที่ อก ๐๓๒๐/๑๑๓๔๒ ลงวันที่ ๒๗ กรกฎาคม ๒๕๖๖

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย

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[redacted]

ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒๕ ราย

[redacted]

COPY

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๙๒ จำกัด เลขทะเบียน ว-๐๐๓
ที่ อก ๐๓๒๐/๑๑๓๔๒ ลงวันที่ ๒๗ กรกฎาคม ๒๕๖๖

ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๙๒ รายการ

น้ำเสีย จำนวน 47 รายการ

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

14 Color...

COPY

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

COPY

29 Heptachlor...

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

COPY

อากาศเสีย...

อากาศเสีย (ปล่องระบาย) จำนวน 21 รายการ

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

COPY

19 Total Suspended Particulate...

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

น้ำใต้ดิน จำนวน 111 รายการ

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

COPY

15 Bis(2-chloroethyl)ether...

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

COPY

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

COPY

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
52	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
53	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
54	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
55	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
56	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
57	Di-n-octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
58	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
59	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
60	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method[๔]
61	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
62	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
63	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
64	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
65	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
66	Hexachloro-1,3-butadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
67	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method[๔]
68	α-HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
69	β-HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]

COPY

70 γ-HCH...

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
70	γ-HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
71	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
72	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
73	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
74	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
75	Lead	1) Digestion, Direct Air-Acetylene Flame Method[๔] 2) Digestion, Inductively Coupled Plasma Method[๔]
76	Manganese	Digestion, Inductively Coupled Plasma Method[๔]
77	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method[๔]
78	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
79	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method[๔]
80	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
81	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
82	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method[๔]
83	Naphthalene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method[๔]
84	Nickel	Digestion, Inductively Coupled Plasma Method[๔]
85	Nitrobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method[๔]
86	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]
87	pH	Electrometric Method[๔]
88	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method[๔]

COPY

89 Phenol...

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

COPY

107 m-Xylene

ร.16/57

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

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 18 รายการ

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

COPY

10 Lead..

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

COPY

ดิน...

ดิน จำนวน 95 รายการ

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

COPY

19 Butyl benzyl phthalate...

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

COPY

38 1,1-Dichloroethane.

1.16/59

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

COPY

56 n-Hexane

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

COPY

14/9/60

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

COPY

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

เอกสารอ้างอิง

1. กระทรวงอุตสาหกรรม. **ประกาศกระทรวงอุตสาหกรรม พ.ศ.2549** เรื่องกำหนดค่าปริมาณเขม่าควันที่เจือปนในอากาศที่ระบายออกจากปล่องของหม้อน้ำโรงสีข้าวที่ใช้แกลบเป็นเชื้อเพลิง. ราชกิจจานุเบกษา. 4 ธันวาคม 2549. เล่มที่ 123 ตอนพิเศษ 125 ง.

2. กระทรวงอุตสาหกรรม. **ประกาศกระทรวงอุตสาหกรรม พ.ศ.2548** เรื่อง การกำจัดสิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว. ราชกิจจานุเบกษา. 25 มกราคม 2549. เล่มที่ 123 ตอนพิเศษ 11ง.

3. สมาคมวิศวกรรมสิ่งแวดล้อมแห่งประเทศไทย. คู่มือวิเคราะห์น้ำเสีย. พิมพ์ครั้งที่ 4. กรุงเทพฯ: เรือนแก้วการพิมพ์, 2547.

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5. United States Environmental Protection Agency. **Standard of Performance for New Stationary Sources.** 40 CFR Part 60. Appendix A, 2017.

6. United States Environmental Protection Agency. **Standard of Performance for New Stationary Sources.** 40 CFR Part 60. Appendix A, 2019.

7. United States Environmental Protection Agency. **Standard of Performance for New Stationary Sources.** 40 CFR Part 60, Appendix A, 2020.

8. United States Environmental Protection Agency. **Standard of Performance for New Stationary Sources.** 40 CFR Part 60. Appendix A, 2023.

9. United States Environmental Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods **Acid Digestion of Sediments Sludge and Soils. SW-846 Method 3050B,** 1996.

10. United States Environment Protection Agency. Test Methods for Evaluation Solid Watste Physical/Chemical Methods. **Inductively Coupled Plasma-Atomic Emission spectrometry. SW-846 Method 6010C,** 2007.

11. United States Environment Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique). SW-846 Method 7471B,** 2007.

12. United States Environment Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Alkaline digestion for Hexavalent Chromium. SW-846 Method 3060A,** 1996.

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13. United States Environment Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Chromium. Hexavalent (Colorimetric). SW-846 Method 7196A,** 1992

14. United States Environment Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples. SW-846 Method 5035A,** 2002

15. United States Environment Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Ultrasonic Extraction. SW-846 Method 3550C,** 2007

16. United States Environment Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS). SW-846 Method 8260D,** 2018

17. United States Environment Protection Agency. Test Methods for Evaluation Solid Waste Physical/Chemical Methods. **Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry. SW-846 Method 8270E,** 2018

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก กรมโรงงานอุตสาหกรรม โทร. ๐ ๓๓๓๓ ๖๐๕๙ ต่อ ๕๐๐๓-๒

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ANALYTICAL BALANCE (DU)

Model : XS205DU

Serial No. : 1126323724

CERTIFICATE OF CALIBRATION

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

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

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by Mr. Somwang Sangdee
Scientist

Approved by (Mr. Somchai Neampunt)
Signed for Director

Issue date 25 December 2023

The uncertainties are for a confidence probability of approximately 95%

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

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REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Capacity : Max 81 g / 220 g

Resolution : 0.01 mg / 0.1 mg

Serial No. : 1126323724

ID No. : LABE 05/1

Result of Calibration

1.Test weight and repeatability of reading

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

Unit : g — Range : 80

☐ No adjustment
☑ Adjustment

	☑ Before adjustment		☑ After adjustment	
Nominal value	40	80	40	80
Standard weight	40.000054	80.000048	40.000054	80.000048
Average reading of indicator	40.00026	80.00037	40.00017	80.00017
Standard deviation	0.000015	0.000016	0.000008	0.000009

Unit : g — Range : 200

☐ No adjustment
☑ Adjustment

	☑ Before adjustment		☑ After adjustment	
Nominal value	100	200	100	200
Standard weight	100.000042	200.000041	100.000042	200.000041
Average reading of indicator	100.0003	200.0004	100.0001	200.0001
Standard deviation	0.00005	0.00005	0.00003	0.00005

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REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

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

Unit : g

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

3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.0000000	0.00000	0.00000	0.000012	2.05
0.01	0.0100025	0.01000	0.00000	0.000012	2.05
0.1	0.1000019	0.10001	-0.00001	0.000013	2.03
1	1.0000125	1.00001	0.00000	0.000015	2.02
5	5.0000208	5.00004	-0.00002	0.000021	2.00
10	10.000004	10.00008	-0.00008	0.000026	2.00
20	20.000030	20.00011	-0.00008	0.000036	2.00
50	50.000014	50.00014	-0.00013	0.000068	2.00
100	100.000042	100.0001	-0.0001	0.00016	2.00
150	150.000056	150.0001	0.0000	0.00022	2.00
200	200.000041	200.0002	-0.0002	0.00027	2.00

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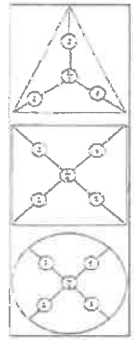
The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95% The standard uncertainty of measurement has been determined in accordance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

REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

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



Weighing pan ◯ Circle ◯ Triangular ◉ Rectangular

Test weight : 50 and 100 Unit : g

Range	80	200
Position	Reading of indicator	Reading of indicator
1	50.00015	100.0001
2	50.00022	100.0001
3	50.00008	100.0001
4	50.00002	100.0000
5	50.00016	100.0002
6	50.00014	100.0001
Maximum difference	0.00013	0.0001

Condition of Calibration

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

Instrument	Class	ID No.	Certificate No.	Due Date
1) STANDARD WEIGHT 1 mg to 1 kg	E2	LB-WE-79	23-105642	10 September 2024

6.

Ambient conditions	Min	Max
Temperature (°C)	22.8	23.0
Relative Humidity (%Rh)	43.5	51.1
Air pressure (hPa)	1012.5	1014.5

End of Report

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11/06/64

ATOMIC ABSORPTION SPECTROPHOTOMETER

Model : PinAAcle 900F

Serial No. : PFBS22080801

PinAAcle 900F Preventive Maintenance (PM)

Company Name:	Eastern Thai Consulting 1992 Ci.,Ltd.		
Address (Instrument Location):	683 Moo 11 Sukapibal 8 Rd. Nong Kham,Si Racha, Chonburi 20230		
Serial Number:	PFBS22080801	**PM Number:**	2 of 2
Customer Name (if applicable):		**Telephone Number:**	
Customer Support Engineer Name:	Khwanchai	**Service Order Number:**	WO-01886639
Date PM Performed: (DD-MMM-YYYY)	24-Oct-2023	**Next PM Due Date:** (DD-MMM-YYYY)	24-Apr-2024
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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Component List

Component / Specific Model	Serial #	Configuration Notes
FIAS100		

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	**Description**	**Quantity**
B0501696	Fan Filters	NA
N3160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	NA
N3160157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	NA
N9301714	Replacement Acetylene Filter Cartridge	NA
TH001022	Replacement Air Filter Cartridge	NA

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	26-B7CUY1	30-Jan-2024

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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Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	MG0-056
N1013002	1.0A Neutral density filter	1	MG2-054
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	092216-010130
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190

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Procedure Checklist

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

1. General:
   - ☑ Review the instrument performance with the customer and document any recent problems.
   - ☑ Inspect the customer log book and make any appropriate PM entries.
   - ☑ Perform general inspection of system for cleanliness.
2. PC 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 N20-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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7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C_2H_2 Flame correctly shuts down	Active	Pass
Drain Sensor	Air/C_2H_2 Flame correctly shuts down	Active	Pass
Nebulizer Sensor	Air/C_2H_2 Flame correctly shuts down	Active	Pass
C_2H_2 Pressure Sensor	Air/C_2H_2 Flame correctly shuts down	Active	Pass
Air Pressure Sensor	Air/C_2H_2 Flame correctly shuts down	Active	Pass
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Pass

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.	1.0531	1.0230	Pass
0.2 A ND Filter	± 5% from Cert.	0.1806	0.1783	Pass

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	0.0015	Pass

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0001	Pass

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8.4 D_2 Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0054	Pass

8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0001	Pass

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	0.0002	Pass

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.	NA	NA
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3878	Pass

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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Additional Comments

Additional Comments Regarding the PM

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: K L S.	Date: 24-Oct-2023 (DD-MMM-YYYY)
Authorized Customer Representative: [illegible]	Date: 24-Oct-2023 (DD-MMM-YYYY)

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BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41

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

CALIBRATION CERTIFICATE

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

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

Equipment : Analog Barometer

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

Calibrated by : Mr. Saruth Srichutikul

Calibration Method or Calibration Procedure Used

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

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

Result of Calibration

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

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

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

CERTIFIED MIT

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Certificate No : L202405022-0013

Environment Ambient Temperature : (25 ± 2)°C
Relative Humidity : (50 ± 15)%RH

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

STD = Standard **Pass =** **|error| + |uncertainty| <= |MPE|**
UUC = Unit Under Calibration **Fail =** **|error| + |uncertainty| > |MPE|**
MPE = Maximum Permissible Error

Calibrated condition :

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

Description of UUC :

Range	950 - 1080	mbar Absolute
Calibration Range	990 - 1030	mbar Absolute
Scale Interval	1	mbar

Condition As-Received : Used Item
The measurment results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

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

End of Certificate

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Hot Air Oven

Model : UM 400

Serial No. : 900982

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NSC-TISI-TIS17025 CALIBRATION 0152

CERTIFICATE OF CALIBRATION

Certificate No. : 24-001944

Sample Code : 24-00963-001

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

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

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert Model : UM 400

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

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

Condition of Calibration

1. Environment
   - 1.1 Ambient temperature : Maximum 30.6 °C , Minimum 29.2 °C
   - 1.2 Relative humidity : Maximum 57.5 % ; Minimum 46.4 %
   - 1.3 Line voltage supplied : Maximum 229.5 VAC ; Minimum 222.5 VAC
2. Calibration method
   TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.
3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-Pt100)	LB-DA-10 (RTD-257 to RTD-265)	23-066256	29 June 2024

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

Calibrated by Mr. Sarawoot Thammo
Scientist

Approved by (Mr. Somchai Neampunt)
Signed for Director

Issue date 09 January 2024

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

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

14.16/73

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NSC-TISI-TIS17025 CALIBRATION 0152

REPORT OF CALIBRATION

Certificate No. : 24-001944

Sample Code : 24-00963-001

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)									Uncertainty ± (°C)	Coverage factor k
			#1	#2	#3	#4	#5	#6	#7	#8	#9 Ref		
60	60.0	60.0	60.04	59.90	59.81	59.84	59.47	59.91	60.08	59.98	59.87	0.25	2.00
85	85.0	85.0	86.07	85.75	85.58	85.62	84.69	85.83	86.28	85.94	85.77	0.34	2.00

2. Characterization results

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

Notes

- UUC* = Unit Under Calibration

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361 Soi Ladprao 122, Ladprao Road, Phlabphla, Wang Thonglang, Bangkok 10310
TEL 02-516-2422 FAX 02-516-6949
CONTACT@AMARC.CO.TH WWW.AMARC.CO.TH
FM-CL-018 Rev 09 Effective Date 15/10/21

REPORT OF CALIBRATION

Certificate No. : 24-001944

Sample Code : 24-00963-001

Results of Calibration

Notes

1. Sensor installation locations
   - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
   - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
   W = 40 cm ; D = 28 cm ; H = 39 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes" Stability of chamber and loading effect in chamber at 20% of uniformity ".

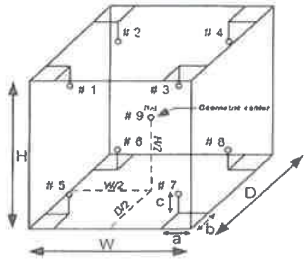

Figure: Example of sensor installation Positions

6. Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC' reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

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

- End of Report -

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14/16/74

ICP-OES/Avio550

Serial No. : M81S2210101

ICP-OES/Avio550 Preventive Maintenance (PM)

Company Name:	Eastern Thai Consulting 1992 Co., Ltd.		
Address (Instrument Location):	683 Moo 11 Sukhapibarn 8 Rd.,Siracha, Chon Buri 20230		
Serial Number:	M8152210101	**PM Number:**	1 OF 2 W
Customer Name (if applicable):	K.Nunnaphat	**Telephone Number:**	038 481 197
Service Engineer Name:	K.Piyawit	**Service Order Number:**	WO-02754304
Date PM Performed: (DD-MMM-YYYY)	25-Apr-2024	**Next PM Due Date:** (DD-MMM-YYYY)	25-Oct-2024
Standard Labor Hours to Complete PM :		**4 hours**	

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

PerkinElmer

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

General Instructions:
The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.
Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.
Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
Avio550Max	M81S2210101	Syngistix 5.1.0.0293

Parts Lists

Parts Included with the PM

Part Number (if applicable)	Description	Quantity
09995098	Air Fiter-Spectrometer	N/A
N077520	Air Fiter-RF Generetor	N/A
09992731	Axial Window	N/A
B0810377	Radial Window	N/A
N0770438	O-ring kit, injector support adapter	N/A
N0780437	O-ring kit, torch	N/A

Additional Reagents and Standards Required for PM

Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N0691579	Muti-Element Standard	AR	61-176CRX1	30-JUN-2025
N9300221	DL Standard diluted 100 X	AR	59-091CRY1	30-JUN-2024
N0582152	Wave Cal Solution	AR	59-150CRX1	30-SEP-2024
N9302946	VIS Wavecal Solution	AR	59-113CRT1	28-FEB-2025

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11/6/76

Procedure Checklist

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

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

2. **Mechanical:**
   - ☑ Inspect and clean all fans and filters.
   - ☑ Inspect and replace torch components and necessary.

     Torch Components Replaced: ☐Yes ☑No
   - ☑ Inspect all tubing for signs of cracking or leaking and replace as necessary.

     Tubing Replaced: ☑Yes ☐No
   - ☑ Inspect the peristaltic pump for proper operation.
   - ☑ Check and adjust if necessary, the external nitrogen, argon shear gas and water supply pressures.
   - ☑ Check and adjust if necessary, the internal nitrogen, main argon, torch argon and shear gas pressures.

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

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

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

   RF Generator:
   - ☑ Check the RF generator status screens.
   - ☑ Check the function of all interlocks.

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

4. **Optical:**
   - ☑ Clean or replace the axial and radial view windows as necessary.

     Axial Window Replaced: ☐Yes ☑No

     Radial Window Replaced: ☐Yes ☑No

5. **PM Performance Tests:**
   - ☑ Perform View Align.

   Test Spectral Resolution:

   ☑ Measure the spectrometers ability to separate two adjacent wavelengths.

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

   Test Precision:

   ☑ Test for reproducibility of a set of measurement.

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

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11/6/17

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

Test Axial BEC Cd:

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

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

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

Test Radial BEC Mn:

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

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

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

6. **Review:**
   - ☑ Review with the customer PM work performed.
   - ☑ Discuss recommended customer supplied materials to have on hand.
   - ☑ Attach PM sticker.

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Additional Comments

Additional Comments Regarding the PM

Review

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

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

Review of Preventive Maintenance:

Authorized PerkinElmer Representative: Piyawit S.	Date: 25-Apr-2024 (DD-MMM-YYYY)
Authorized Customer Representative:	Date: 25-Apr-2024 (DD-MMM-YYYY)

COPY

11.16/78

MERCURY ANALYZER

Model : RA-4500

Serial No. : 21780504

Eastern Thai Consulting 1992 Co., Ltd.

Automatic Mercury Analyzer

Model RA-4500

Preventive Maintenance Report

Serial No. : 21780504

Soft version : Ver 2.0.7

ROM version : Ver 2.0.1

Date : August 9, 2023

PM by : (Pathom S.)

Approved by : (Phongpan R.)

Coax Group Corporation Ltd.
1131/62,64,325-331 Nakornchaisri road,
Kwang ThanonNakornchaisri, Dusit, Bangkok 10300 Thailand
Tel. 02-2435263, 02-6682436 Fax. 02-2437386

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Inspection result

ITEM	STANDARD	RESULT	JUDGE
1. Self Check			
1.1 Leak check	0.14 - 2.0 L/min.	0.18 L/min	PASS
1.2 Sig/Ref check	3.0 - 4.0 volte	Sig:4.01V., Ref:4.09V.	PASS
1.3 Drift check	0.0000047 - 0.0000014	0.0000038	PASS
2. Analytical curve inspection(AREA)			
2.1 No Pretreatment	Correlation coefficient (r) ≥ 0.9990	1.0000	PASS
3. Repeatability(AREA)			
3.1 No Pretreatment 50ug/L, n=3		1. 50.353 ug/L 2. 51.477 ug/L 3. 51.306 ug/L	
	C.V. ≤ 5%	1.19%	PASS
4. Blank	Below 1.0(AREA)	0.386	OK

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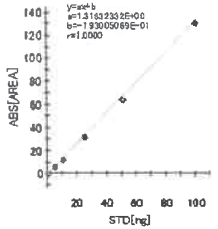
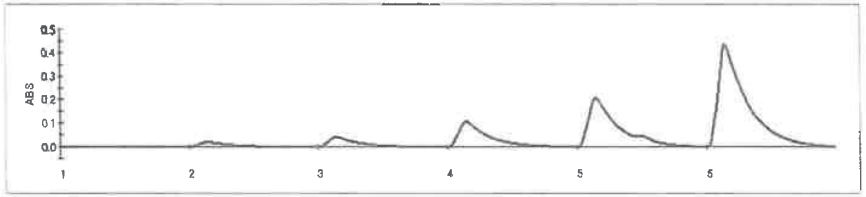
Title : RA-4500 Preventive Maintenance
Date : 9/8/2566
Name : Coax Group
Memo : Calibration curve (No Pretreatment)

Calib



STD

No	STD [ppb]	SVOL [mL]	CVOL [mL]	DVOL [mL]	STD [ng]	AREA [ON]	MEAS [ng]	Dev [%]	Note
1	0.000	5.000	5.000	5.000	0.000	0.3869	0.4405	-	
2	50.000	0.100	5.000	5.000	5.000	6.6907	5.2295	4.6	
3	50.000	0.200	5.000	5.000	10.000	12.4017	9.5681	4.3	
4	50.000	0.500	5.000	5.000	25.000	32.5205	24.8522	0.6	
5	50.000	1.000	5.000	5.000	50.000	65.2046	49.6820	0.6	
6	50.000	2.000	5.000	5.000	100.000	131.7390	100.2277	0.2	

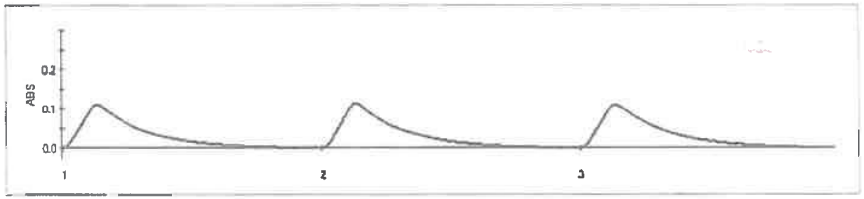


SMP

No.	NAME	SVOL [mL]	CVOL [mL]	DVOL [mL]	AREA [ON]	MEAS [ng]	CONC [ug/L]	Note
1	50ug/L	0.500	5.000	5.000	32.9478	25.1768	50.3536	
2	50ug/L	0.500	5.000	5.000	33.6875	25.7387	51.4774	
3	50ug/L	0.500	5.000	5.000	33.5749	25.6532	51.3064	

Statistics

No.	NAME	TRY	AV [ug/L]	SD [ug/L]	Cv [%]
1	50ug/L	3	51.04580	0.6055294	1.19



Self Check

Heat check:PASS!! (26.0degC[05:00] -> 30.0degC[03:06])
Sensor check:PASS!! (1113- 58=1055)
Leak check:PASS!! (0.18L/min)
Sig/Ref check:PASS!! (Sig:4.01V, Ref:4.09V)
Drift check:PASS!! (0.0000036 - -0.0000002 = 0.0000038)

14.16/81

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STANDARD WEIGHT 50 g

AMARC | ASIA MEDICAL AND AGRICULTURAL LABORATORY AND RESEARCH CENTER

NSC-TISI-TIS17025
CALIBRATION 0152

Certificate No. : 22-052238
Sample Code : 22-19150-003

CERTIFICATE OF CALIBRATION

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

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

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by Mr. Somwang Sangdee
Scientist

Approved by (Mr. Somchai Neampunt)
Signed for Director

Issue date 31 May 2022

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

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

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

14.16/83

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NSC-TISI-TIS17025
CALIBRATION 0152

Certificate No. : 22-052238
Sample Code : 22-19150-003

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class F1

Serial No. : N/A

ID No. : LABE 10/1

Result of Calibration : ◉ Without adjustment ○ Adjustment

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

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

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

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NSC-TISI-TIS17025
CALIBRATION 0152

Certificate No. : 22-052238

Sample Code : 22-19150-003

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.20 kg/m^3

2. Calibration Method : Direct comparison weighing according to OIML R111-1 : 2004(E)

3. Reference standard instrument

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

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :	
Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

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14/6/64

STANDARD WEIGHT 100 g

Certificate No. : 22-052239

Sample Code : 22-19150-004

CERTIFICATE OF CALIBRATION

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

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

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by Mr. Somwang Sangdee
Scientist

Approved by (Mr. Somchai Neampunt)
Signed for Director

Issue date 31 May 2022

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

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

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

Certificate No. : 22-052239

Sample Code : 22-19150-004

REPORT OF CALIBRATION

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class N/A

Serial No. : N/A

ID No. : LABE 10/2

Result of Calibration : ◉ Without adjustment ○ Adjustment

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

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

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

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11/16/86

Certificate No. : 22-052239

Sample Code : 22-19150-004

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m^3

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

3. Reference standard instrument

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

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

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

- End of Report -

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STANDARD WEIGHT 50 g

Certificate No. : 22-052237

Sample Code : 22-19150-002

CERTIFICATE OF CALIBRATION

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

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

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

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

Issue date : 31 May 2022

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

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

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

Certificate No. : 22-052237

Sample Code : 22-19150-002

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class N/A

Serial No. : N/A

ID No. : LABE 10/4

Result of Calibration : (●) Without adjustment ( ) Adjustment

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

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

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

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14/6/89

AMARC | ASIA MEDICAL AND AGRICULTURAL LABORATORY AND RESEARCH CENTER

NSC-TISI-TIS17025
CALIBRATION 0152

Certificate No. : 22-052237

Sample Code : 22-19150-002

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m^3

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

3. Reference standard instrument

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

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

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

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

- End of Report -

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11/6/90

THERMO-HYGROMETER

Model : 608-H1

Serial No. : 45106737

AMARC | ASIA MEDICAL AND AGRICULTURAL LABORATORY AND RESEARCH CENTER

NSC-TISI-TIS17025 CALIBRATION 0152

CERTIFICATE OF CALIBRATION

Certificate No. : 24-062442

Sample Code : 24-25546-002

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

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

Equipment : Digital thermo-hygrometer

Manufacturer : testo | Model : 608-H1

Serial No. : 45106737 | ID No. : LABE 09/7

Date of Receipt : 23 May 2024 | Date of Calibration : 27-28 May 2024

Condition of Calibration

1. Environment
   1.1 Ambient temperature : 23.0 °C ± 3.0 °C
   1.2 Relative humidity : 55.0 % ± 15.0 %
2. Calibration method
   2.1 In-house method: WI-CL-045 By comparison with thermometer standard / chilled mirror hygrometer in controlled chamber.
   2.2 The calibration by comparison unit under calibration (UUC) to the thermometer standard / chilled mirror hygrometer in a chamber at the controlled temperature / relative humidity.
3. Reference standard instrument

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

4. This certificate is traceable to the international system of unit (SI Unit).
   4.1 Instrument No. 3.1 through National Institute of Metrology (Thailand).
   4.2 Instrument No. 3.2 and 3.3 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of calibration item : Normal

Calibrated by : Miss Pornsuda Lohabal, Scientist

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

Issue date : 30 May 2024

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

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

11/6/92

AMARC | ASIA MEDICAL AND AGRICULTURAL LABORATORY AND RESEARCH CENTER

NSC-TISI-TIS17025 CALIBRATION 0152

REPORT OF CALIBRATION

Certificate No. : 24-062442

Sample Code : 24-25546-002

Results of Calibration

Temperature measurement

Resolution : 0.1 °C

Range : 0 °C to 50 °C

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

Humidity measurement

Resolution : 0.1 %RH

Range : 10 %RH to 95 %RH

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

Notes

- Calibration results without adjustment.

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

- End of Report -

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UV/VIS SPECTROPHOTOMETER

Model : UV-1800

Serial No. : A11635101643 CD

Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor7 Rama4 Road
Silom Bangrak Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com

Certificate of Calibration

Certificate No.	BSCC-UV-146/24
Equipment	UV/Vis Spectrophotometer
Model	UV-1800
Manufacturer	Shimadzu
Serial No.	A11635101643 CD
ID No.	LABE 03/2
Date of receipt	22 April 2024
Date of calibration	22 April 2024
Date of issue	29 April 2024
Customer name	Eastern Thai Consulting 1992 Co., Ltd.
Address	683 Moo 11, Sukkhaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230
Temperature	(22.9-24.1) °C (On site)
Humidity	(41.7-46.9) %RH (On site)
Equipment condition	Good Operation
Calibration Location	Analysis Department
Calibration Procedure	In-house method WI-UV-702-01 based on ASTM E275-01
Traceability	Wavelength Accuracy is traceable to certificate No 116614 and 116613 Photometric Accuracy is traceable to certificate No. 116210 and 116224 Stray Light is traceable to certificate No 116616 The above certificate are traceble to SI unit through Starna Scientific Ltd (UKAS accredited calibration laboratory NO 0659)
Calibrated by	Mr Poomjai Korsawatvorakul

Approved by

Mr.Sonthi Temboonsakdi
Service Manager

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Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com

Certificate of Calibration

Calibration Results:

1.Wavelength Accuracy

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

2.Photometric Accuracy (UV)

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

*CNR = Customer not request

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www.barascientific.com

Certificate of Calibration

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

Calibration Results:

3.Photometric Accuracy (Visible)

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

*CNR = Customer not request

4.Stray Light*

Standard	Unit Under Calibration(UUC)		
cut-off wavelenght (nm)	Wavelength (nm)	Transmission (%T)	Absorbance (A)
201.33±0.11nm	200.80	0.9750	2.0111

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A
*Stray Light not NSC-ONSC Accredited.

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

End of Certificate

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Calibration Results:

pH Scale

Input	pH Meter Reading			Uncertainty of Measurement (mV)	Coverage Factor (k)
(mV)	(mV)	Error (mV)	(pH)		
414.12	415	0.88	0.00	0.58	2.00
354.96	356	1.04	1.00	0.58	2.00
295.8	296	0.20	2.00	0.58	2.00
236.64	237	0.36	3.00	0.58	2.00
177.48	178	0.52	4.00	0.58	2.00
118.32	119	0.68	5.00	0.58	2.00
59.16	60	0.84	6.00	0.58	2.00
0	1	1.00	7.00	0.58	2.00
-59.16	-59	0.16	8.00	0.58	2.00
-118.32	-118	0.32	9.00	0.58	2.00
-177.48	-177	0.48	10.00	0.58	2.00
-236.64	-236	0.64	11.00	0.58	2.00
-295.8	-296	-0.20	12.00	0.58	2.00
-354.96	-355	-0.04	13.00	0.58	2.00
-414.12	-414	0.12	14.00	0.58	2.00

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DKSH Technology Limited
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2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

ม.16/96

Certificate of Calibration

Equipment:	pH METER	Certificate No.:	C07230322
Model:	Lab 845	Issued Date:	5 July 2023
Serial No. (or ID.):	21021943	Job No.:	KSPR2310509
Manufacturer:	SI Analytics	Page:	1 of 3
Electrode Serial No.:	C211241005	Model:	TopLine 29 pH Brand: SI Analytics
Condition:	New		

Customer: SOUTHERN THAI CONSULTING CO.,LTD.
59/45 Moo 5 T.Srisoontorn,
A. Talang, Phuket 83110

Environment Condition:

Temperature	23	°C	±	2	°C
Humidity	50	%RH	±	15	%RH

Calibration Place: Environment Laboratory, DKSH Technology Limited.
2533 Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260 Thailand

Calibration By: Mr.Atachai Ngamchanat
Calibration Date: 4 July 2023
The Method used: In house method, CAL-WI-58, base on ASTM E 70-07
Traceability: This certificate is traceable to SI Units, Sample Test is assured through primary meaurement method Harned cell, through CPAchem Ltd. (ISO/IEC 17034) Certificate No. 873613, 873615, 873614 And pH Scale traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Industrial Foundation Electrical and Electronics Institute Certificate No. CA20220477EA

(Mr. Atachai Ngamchanat)
Person in charge

(Mr. Nitinun Srihawan)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Electrode Test Results*

The three-point calibration using three standard buffer solutions; pH 4.008 , pH 6.986 and pH 10.010

- During calibration, display of pH meter can be adjust to reading; pH 4.01 , pH 6.99 and pH 10.01

The practical slope of the pH electrode; 57.50 (mV/pH), 97.19%

The zero point of the pH electrode; 7.17 (pH)

Sample Test Results

Standard Buffer Solution (pH)	Unit Under Calibration (pH)	Difference (pH)	Uncertainty of Measurement (pH)	Coverage Factor (k)
4.008	4.01	0.002	0.0084	2.04
6.986	6.99	0.004	0.0097	2.00
10.010	10.01	0.000	0.0085	2.03

* Calibration Marked " Not TISI Accredited " in this Certificate have been included for completeness.

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The End of Certificate

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Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

ท.16/97

ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2310509

ชนิดเครื่องมือ: pH METER รุ่น: Lab 845 หมายเลขเครื่อง: 21021943

ตรวจสอบ (รับ) 04 Jul 2023 ปกติ	ตรวจสอบ (รับ) 04 Jul 2023 ไม่ปกติ	รายการตรวจเช็ค	ตรวจสอบ (ส่ง) 04 Jul 2023 ปกติ	ตรวจสอบ (ส่ง) 04 Jul 2023 ไม่ปกติ	หมายเหตุ
		General			
☑	☐	1. ความสมบูรณ์เครื่อง	☑	☐	
☑	☐	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	☑	☐	
☑	☐	3. สวิทช์ ปิด – เปิด เครื่อง (On-Off Swicth)	☑	☐	
☑	☐	4. ปุ่มกด (Keypad)	☑	☐	
☑	☐	5. หน้าจอ (Display, Screen Contrast)	☑	☐	
		Spectrophotometer			
☐	☐	6. แรงดันไฟฟ้า (Battery Backup) >= 2.5 VDC	☐	☐	
☐	☐	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	☐	☐	
☐	☐	8. ความยาวคลื่น (Wavelength Check)	☐	☐	
☐	☐	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	☐	☐	
☐	☐	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	☐	☐	
☐	☐	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	☐	☐	
		pH Meter and Conductivity Meter			
☑	☐	12. อิเล็คโทรด (Electrode and Connection Cable)	☑	☐	
☐	☐	13. ระดับสารละลายใน Electrode (Level KCl)	☐	☐	
☑	☐	14. ฝาปิดกันปลาย Electrode (Dust Protection Hood)	☑	☐	
☑	☐	15. ขาจับอิเล็คโทรด (Stand)	☑	☐	
		Turbidimeter			
☐	☐	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	☐	☐	
☐	☐	17. ระดับการส่องสว่างของแสง (>= 2.5 ไม่เกิน 3.0)	☐	☐	
		Automatic titrator			
☐	☐	18. สภาพ Piston Burettes	☐	☐	
☐	☐	19. Function Rinsing and Dosing	☐	☐	
☐	☐	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	☐	☐	

เพิ่มเติม/ข้อแนะนำ : Electrode วัดอุณหภูมิได้ 24.9°C โดย Control Waterbath ที่ 25.0 ±0.1°C

Mr.Atachai Ngamchanat
Service Engineer

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NSC-TISI-TIS 17025 CALIBRATION 0209

Certificate of Calibration

Certificate No. BSCC-UV-437/23 Number of Page(s) 2 of 3

Calibration Results:

1.Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
360.89	360.79	-0.10	0.18
418.53	418.50	-0.03	0.18
513.39	513.40	0.01	0.18
572.99	573.10	0.11	0.18
879.41	879.40	-0.01	0.18

2.Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
257	0.0000	0.0000	0.0000	0.0075
	0.8579	0.8547	-0.0032	0.0075
313	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	0.0075
	0.6376	0.6362	-0.0014	0.0075

*CNR = Customer not request

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NSC-TISI-TIS 17025 CALIBRATION 0209

Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No.	BSCC-UV-437/23
Equipment	UV/Vis Spectrophotometer
Model	UV-1800
Manufacturer	SHIMADZU
Serial No.	A11635305233CD
ID No.	UV-03
Date of receipt	6 November 2023
Date of calibration	6 November 2023
Date of issue	10 November 2023
Customer name	Southern Thai Consulting Co., Ltd.
Address	59/45 Moo 5, Srisoontorn, Talang, Phuket 83110
Temperature	(26.9-27.2) °C (On site)
Humidity	(60.1-63.1) %RH (On site)
Equipment condition	Good Operation
Calibration Location	Laboratory
Calibration Procedure	In-house method WI-UV-702-01 based on ASTM E275-01
Traceability	Wavelength Accuracy is traceable to certificate No. 99394 and 99395 Photometric Accuracy is traceable to certificate No. 99380 and 99387 Stray Light is traceable to certificate No. 99385 The above certificate are traceble to SI unit through Starna Scientific Ltd. (UKAS accredited calibration laboratory NO. 0659)
Calibrated by	Mr.Sarunkorn Pukaothong

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Approved by

Mr.Kanchit Choothep
Technical Manager

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FM-UV-708-02 Rev.01 (23/01/63)

11/16/98

PREMIER SYSTEM ENGINEERING CO., LTD.
123 Moo 8 Kanjanavanit Rd., Banpru, Hatyai, Songkhla 90250
E-mail : pse-cal@sritranggroup.com ,Fax. : (074)222912 Tel. : 084-2148162, 084-2148165, 074-222900-9

NSC-TISI-TIS 17025
CALIBRATION 0024

CALIBRATION CERTIFICATE

CERTIFICATE No. : T23-3234
CSR No. : 231381

Customer	:	Southern Thai Consulting Co., Ltd. 59/45 Moo5 Srisoontorn, Talang, Phuket 83110
Equipment	:	Refrigerator
Manufacturer	:	Senden Intercool
Model	:	SEA-0405
Serial No.	:	SEA0405-191200194
ID. No.	:	-
Resolution	:	0.1 °C
Instrument Condition	:	Good Condition
Location of Calibration	:	Customer Laboratory
Ambient Temperature	:	(30 ± 15) °C
Relative Humidity	:	(60 ± 20) %
Date of Received	:	16-Nov-2023
Date of Calibration	:	16-Nov-2023
Date of Issued	:	20-Nov-2023

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APPROVED BY :

Calibrated By : Mr. Athiwat Supacheewa
(Temperature Supervisor)

APPROVED SIGNATORY
(/) MR. PIYAPONG RATTANAKAN / Calibration Manager
( ) MR. METHA CHUAIBUN / Quality Manager
( ) MR. BUNPOT SUWANNARAT / Technical Manager

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

@PSE-CAL

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NSC-TISI-TIS 17025
CALIBRATION 0209

Certificate of Calibration

Certificate No. BSCC-UV-437/23 Number of Page(s) 3 of 3

Calibration Results:

3.Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
440.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
465.0	0.0000	0.0000	0.0000	0.0042
	0.4894	0.4891	-0.0003	0.0042
	0.6798	0.6795	-0.0003	0.0042
	0.9691	0.9681	-0.0010	0.0042
546.1	0.0000	0.0000	0.0000	0.0042
	0.5042	0.5026	-0.0016	0.0042
	0.6899	0.6882	-0.0017	0.0042
	0.9822	0.9801	-0.0021	0.0042
590.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
635.0	0.0000	0.0000	0.0000	0.0042
	0.5181	0.5163	-0.0018	0.0042
	0.6878	0.6860	-0.0018	0.0042
	0.9751	0.9725	-0.0026	0.0042

*CNR = Customer not request

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4.Stray Light*

Standard	Unit Under Calibration(UUC)		
cut-off wavelenght (nm)	Wavelength (nm)	Transmission (%T)	Absorbance (A)
200.98±0.11nm	201.00	0.9400	2.0269

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A
*Stray Light not NSC-ONSC Accredited.

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

End of Certificate

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น.16/99

Equipment	:	Refrigerator
Manufacturer	:	Senden Intercool
Model	:	SEA-0405
Serial No.	:	SEA0405-191200194
ID. No.	:	-
Date of Received	:	16-Nov-2023
Date of Calibration	:	16-Nov-2023

REFERENCE STANDARD INSTRUMENT :

Instrument Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Digital Thermometer with Sensor	34970 A	MY 44042662	DAT003/0823	01-08-2024	PSE

CALIBRATION METHOD :

In-house method : CA.WI.11.160 based on ASTM E145 : 1994 (re-approved 2011)

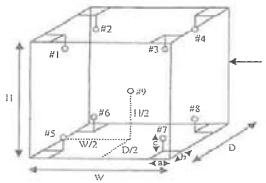
TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurment according to the International System of Unit (SI) through :

PSE : Premier System Engineering Co., Ltd. ,(NSC-TISI-TIS 17025 CALIBRATION 0024)

CALIBRATION RESULTS :

Sensor Installation Diagram



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Dimension of the chamber	:	W x H x D	=	55 x 164 x 43 cm
Sensor Installation	:	a x b x c	=	5 x 5 x 5 cm

The uncertainties are for a confidence probability of approximately 95 %.
The above results are valid exclusively for calibration sample as mentioned in the report.
This result of calibration was found accurate as shown on date and place of calibration only.

Equipment	:	Refrigerator
Manufacture	:	Senden Intercool
Model	:	SEA-0405
Serial No.	:	SEA0405-191200194
ID. No.	:	-
Date of Received	:	16-Nov-2023
Date of Calibration	:	16-Nov-2023

CALIBRATION RESULTS : (Cont.)

(/) Without Adjustment ( ) After Adjustment

Temperature Measurement Accuracy Test

The measurement results of the refrigerator and associates are reported in the manner as shown below

Cal Point	Measured Standard Temperature (°C) at Spread Locations									Uncertainty
(°C)	#1	#2	#3	#4	#5	#6	#7	#8	Ref. 9	(± °C)
4	4.78	4.58	4.20	4.01	4.57	4.79	4.37	4.23	4.23	1.2

Refrigerator Performance Result

The performance of the refrigerator are reported as shown below

Cal Point (°C)	UUC Setting (°C)	UUC Reading (°C)	Chamber Stability (± °C)	Chamber Uniformity (± °C)	Overall Variation (± °C)
4	4.0	4.0	0.97	1.35	2.48

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UUC : Unit Under Calibration

The uncertainties are for a confidence probability of approximately 95 %.
The above results are valid exclusively for calibration sample as mentioned in the report.
This result of calibration was found accurate as shown on date and place of calibration only.

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PREMIER SYSTEM ENGINEERING CO., LTD.
123 Moo 8 Kanjanavanit Rd., Banpru, Hatyai, Songkhla 90250
E-mail : pse-cal@sritranggroup.com ,Fax. : (074)222912 Tel. : 084-2148162, 084-2148165, 074-222900-9

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NSC-TISI-TIS 17025
CALIBRATION 0024

CALIBRATION CERTIFICATE

CERTIFICATE No. : T23-3236
CSR No. : 231381
Page : 1 of 4

Customer	:	Southern Thai Consulting Co., Ltd. 59/45 Moo5 Srisoontorn, Talang, Phuket 83110
Equipment	:	Incubator
Manufacturer	:	ACCUPLUS
Model	:	EC8500
Serial No.	:	0408-0415-0034
ID. No.	:	-
Resolution	:	0.1 °C
Instrument Condition	:	Good Condition
Location of Calibration	:	Customer Laboratory
Ambient Temperature	:	(30 ± 15) °C
Relative Humidity	:	(60 ± 20) %
Date of Received	:	16-Nov-2023
Date of Calibration	:	16-Nov-2023
Date of Issued	:	20-Nov-2023

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APPROVED BY :

Calibrated By : Mr. Athiwat Supacheewa
(Temperature Supervisor)

APPROVED SIGNATORY
( ) MR. PIYAPONG RATTANAKAN / Calibration Manager
( ) MR. METHA CHUAIBUN / Quality Manager
( ) MR. BUNPOT SUWANNARAT / Technical Manager

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

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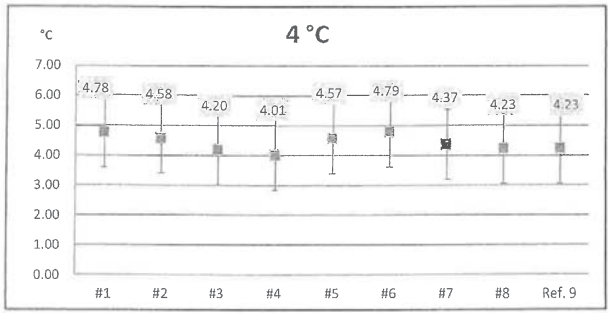
Report Graph



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The above results are valid exclusively for calibration sample as mentioned in the report.
This result of calibration was found accurate as shown on date and place of calibration only.

-- End --

Equipment	:	Incubator
Manufacturer	:	ACCUPLUS
Model	:	EC8500
Serial No.	:	0408-0415-0034
ID. No.	:	-
Date of Received	:	16-Nov-2023
Date of Calibration	:	16-Nov-2023

REFERENCE STANDARD INSTRUMENT :

Instrument Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Digital Thermometer with Sensor	34970 A	MY 44042662	DAT003/0823	01-08-2024	PSE

CALIBRATION METHOD :

In-house method : CA.WI.11.160 based on ASTM E145 : 1994 (re-approved 2011)

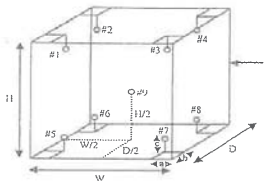
TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurment according to the International System of Unit (SI) through :

PSE : Premier System Engineering Co., Ltd. ,(NSC-TISI-TIS 17025 CALIBRATION 0024)

CALIBRATION RESULTS :

Sensor Installation Diagram



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Dimension of the chamber	:	W x H x D	=	56 x 168 x 60 cm
Sensor Installation	:	a x b x c	=	5 x 5 x 5 cm

The uncertainties are for a confidence probability of approximately 95 %.
The above results are valid exclusively for calibration sample as mentioned in the report.
This result of calibration was found accurate as shown on date and place of calibration only.

Equipment	:	Incubator
Manufacture	:	ACCUPLUS
Model	:	EC8500
Serial No.	:	0408-0415-0034
ID. No.	:	-
Date of Received	:	16-Nov-2023
Date of Calibration	:	16-Nov-2023

CALIBRATION RESULTS : (Cont.)

(/) Without Adjustment ( ) After Adjustment

Temperature Measurement Accuracy Test

The measurement results of the incubator and associates are reported in the manner as shown below

Cal Point	Measured Standard Temperature (°C) at Spread Locations									Uncertainty
(°C)	#1	#2	#3	#4	#5	#6	#7	#8	Ref. 9	(± °C)
20	20.27	20.22	20.28	20.25	20.10	20.24	20.14	19.95	20.20	0.71

Incubator Performance Result

The performance of the incubator are reported as shown below

Cal Point (°C)	UUC Setting (°C)	UUC Reading (°C)	Chamber Stability (± °C)	Chamber Uniformity (± °C)	Overall Variation (± °C)
20	20.0	20.0	0.16	0.37	0.58

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UUC : Unit Under Calibration

The uncertainties are for a confidence probability of approximately 95 % .
The above results are valid exclusively for calibration sample as mentioned in the report.
This result of calibration was found accurate as shown on date and place of calibration only.

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NSC-TISI-TIS 17025
CALIBRATION 0024

CALIBRATION CERTIFICATE

CERTIFICATE No. : T23-3490
CSR No. : 231425

Customer	:	Southern Thai Consulting Co., Ltd. 59/45 Moo5 Srisoontorn, Talang, Phuket 83110
Equipment	:	Liquid in Glass Thermometer
Manufacture	:	PRECISION
Model	:	-
Serial No.	:	5319
ID. No.	:	-
Range	:	-10 ~ 420 °C °C
Resolution	:	1 °C
Instrument Condition	:	Good Condition
Location of Calibration	:	PSE Laboratory
Ambient Temperature	:	(25 ± 3) °C
Relative Humidity	:	(55 ± 15) %
Received Date	:	20-Nov-2023
Calibration Date	:	24-Nov-2023
Date of Issue	:	27-Nov-2023

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APPROVED BY :

Calibrated By :Mr. Athiwat Supacheewa
(Temperature Supervisor)

APPROVED SIGNATORY
( ) MR. PIYAPONG RATTANAKAN / Calibration Manager
( ) MR. METHA CHUAIBUN / Quality Manager
( ) MR. BUNPOT SUWANNARAT / Technical Manager

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

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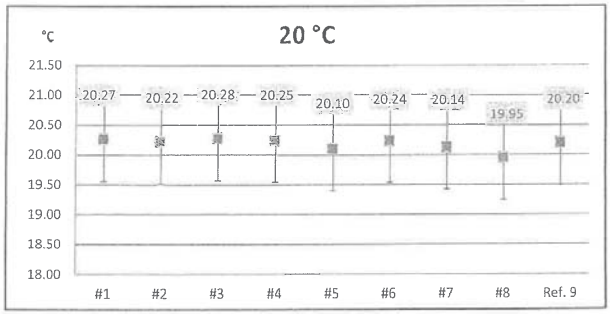
Report Graph



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The above results are valid exclusively for calibration sample as mentioned in the report.
This result of calibration was found accurate as shown on date and place of calibration only.
-- End --

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NSC-TISI-TIS 17025 CALIBRATION 0024

CALIBRATION CERTIFICATE

CERTIFICATE No. : M23-1727
CSR No. : 231381
Page : 1 of 3

Customer	:	Southern Thai Consulting Co., Ltd. 59/45 Moo5 Srisoontorn, Talang, Phuket 83110
Equipment	:	Analytical Balance
Manufacturer	:	SARTORIUS
Model	:	PRACTUM224-IS
Serial No.	:	0035106544
ID. No.	:	-
Capacity	:	220 g
Resolution	:	0.0001 g
Instrument Condition	:	Good Condition
Location of Calibration	:	Customer Laboratory
Ambient Temperature	:	(30 ± 10) °C
Relative Humidity	:	(50 ± 20) %
Barometric Pressure	:	(1010 ±10) hPa
Date of Received	:	16-Nov-2023
Date of Calibration	:	16-Nov-2023
Date of Issued	:	20-Nov-2023

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APPROVED BY :

APPROVED SIGNATORY
(/) MR. PIYAPONG RATTANAKAN / Calibration Manager
( ) MR. METHA CHUAIBUN / Quality Manager
( ) MR. BUNPOT SUWANNARAT / Technical Manager

Calibrated By : Mr. Piyapol Rongsawat
(Calibration Technician)

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

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CERTIFICATE No. : T23-3490
CSR No. : 231425
Page : 2 of 2

Equipment	:	Liquid in Glass Thermometer
Manufacture	:	PRECISION
Model	:	-
Serial No.	:	5319
ID. No.	:	-
Received Date	:	20-Nov-2023
Calibration Date	:	24-Nov-2023

REFERENCE STANDARD INTRUMENT :

Instrument Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Digital Thermometer With Sensor	1529	B17472	23I257	02-03-2024	TPA

CALIBRATION METHOD :

In-house method : CA.WI.11.043 (ASTM E77-14)

TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurment according to the International System of Unit (SI) through :

TPA : Technology Promotion Association (Thailand-Japan), (NSC-TISI-TIS 17025 CALIBRATION 0008)

CALIBRATION RESULTS :

(/) Without Adjustment ( ) After Adjustment
Immersion : Total Type of Liquid : Alcohol
Ice Point Reading : -1.50 °C

Cal Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Correction (°C)	Uncertainty (±°C)
4	5.202	4.0	1.202	0.58
25	26.042	25.0	1.042	0.58

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Readability of UUC : 0.5 °C
UUC* : Unit Under Calibration
The uncertainties are for a confidence probability of approximately 95 %.
The above results are valid exclusively for calibration sample as mentioned in the report.
This result of calibration was found accurate as shown on date and place of calibration only.
-- End --

Equipment	:	Analytical Balance
Manufacturer	:	SARTORIUS
Model	:	PRACTUM224-IS
Serial No.	:	0035106544
ID. No.	:	-
Date of Received	:	16-Nov-2023
Date of Calibration	:	16-Nov-2023

CALIBRATION RESULTS : (Cont.)

(/) Without Adjustment ( ) After Adjustment

EFFECT OF TARE AT 100 g

Nominal Value (g)	UUC* Reading (g)	Correction (g)
20	20.0000	-0.00002
40	40.0000	-0.00003
60	60.0000	0.00000
80	79.9999	0.00009
100	99.9998	0.00018

ERROR OF INDICATION FROM NOMINAL VALUE

Nominal Value (g)	UUC* Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor (k)
* Unload	0.0000	0.00000	0.00020	2.20
0.01	0.0100	0.00000	0.00020	2.20
0.05	0.0500	0.00000	0.00020	2.20
0.1	0.1000	0.00000	0.00020	2.20
0.5	0.5000	0.00000	0.00020	2.20
1	1.0000	-0.00001	0.00020	2.20
2	2.0000	-0.00002	0.00020	2.20
5	5.0000	-0.00002	0.00020	2.20
10	10.0000	0.00001	0.00020	2.18
20	20.0000	-0.00002	0.00020	2.18
40	40.0000	-0.00003	0.00020	2.14
60	60.0000	0.00000	0.00021	2.12
80	79.9999	0.00009	0.00023	2.08
100	100.0000	-0.00002	0.00023	2.08
120	120.0000	-0.00003	0.00026	2.05
140	140.0000	-0.00005	0.00027	2.04
160	160.0001	-0.00012	0.00028	2.03
180	180.0001	-0.00014	0.00031	2.02
200	200.0000	-0.00010	0.00032	2.02

UUC : Unit Under Calibration

The table as per (*) marked are not NSC-ONSC accreditation scope.

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

The above results are valid exclusively for calibration sample as mentioned in the report

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

-- End --

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Equipment	:	Analytical Balance
Manufacturer	:	SARTORIUS
Model	:	PRACTUM224-IS
Serial No.	:	0035106544
ID. No.	:	-
Date of Received	:	16-Nov-2023
Date of Calibration	:	16-Nov-2023

REFERENCE STANDARD INSTRUMENT :

Instrument Type	Norminal Value	Serial No.	Cert. No.	Due Date	Traceability
Standard Weight Set	100 mg ~ 500g	-	C02230001,2	03-01-2024	DKSH

CALIBRATION METHOD :

In-house method : CA.WI.11.015 based on UKAS LAB 14 : 2019

TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurment according to the International System of Unit (SI) through :

DKSH : DKSH Technology Limited. (NSC-TISI-TIS 17025 CALIBRATION 0087)

CALIBRATION RESULTS :

(/) Without Adjustment ( ) After Adjustment

DETERMINATION OF THE STANDARD DEVIATION OF WEIGHT MACHINE (N=10)

Nominal Value (g)	Standard Deviation (g)
200	0.00008

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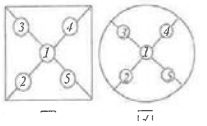
EFFECT OF OFF CENTER LOADING AT 100 g

Position					Maximum Difference (g)
1	2	3	4	5	
100.0000	100.0001	100.0001	100.0001	99.9999	0.0001



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

Equipment	:	Conductivity
Manufacturer	:	APERA
Model	:	EC 8500
Serial No.	:	EC85001323271005
ID. No.	:	-
Date of Received	:	16-Nov-2023
Date of Calibration	:	16-Nov-2023

REFERENCE STANDARD INSTRUMENT :

Instrument Type	Nominal Value/Model	Lot No.	Batch. No.	Due Date	Traceability
Conductivity Standard	84 uS/cm	879340	879340	14-03-2024	CPA Chem
Conductivity Standard	1413.0uS/cm	879342	879342	13-03-2024	CPA Chem
Conductivity Standard	12.88 mS/cm	879343	879343	14-03-2024	CPA Chem

CALIBRATION METHOD :

In-house method : CA.WI.11.181 based on direct measurement by using certified reference material (CRM)

TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurment according to the International System of Unit (SI) through :

CPA Chem : CPA chem Ltd. (ANAB Cert No. AR-1835)

CALIBRATION RESULTS :

(/) Without Adjustment ( ) After Adjustment

Function : Chemical Measurement

Standard Buffer Solutions (µS/cm)	UUC Reading (µS/cm)	Correction (µS/cm)	Uncertianty (±µS/cm)	Coverage Factor (k)
* 84.0	82.7	1.28	1.2	2.01
1413.0	1410	3.4	19	2.00

Standard Buffer Solutions (mS/cm)	UUC Reading (mS/cm)	Correction (mS/cm)	Uncertianty (± mS/cm)	Coverage Factor (k)
12.88	12.94	-0.06	0.18	2.00

UUC : Unit Under Calibration
The table as per (*) marked are not NSC-ONSC accreditation scope.
The uncertainties are for a confidence probability of approximately 95 % .
The above results are valid exclusively for calibration sample as mentioned in the report.
This result of calibration was found accurate as shown on date and place of calibration only.
-- End --

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NSC-TISI-TIS 17025 CALIBRATION 0024

CALIBRATION CERTIFICATE

CERTIFICATE No. : V23-1972
CSR No. : 231381
Page : 1 of 2

Customer	:	Southern Thai Consulting Co., Ltd. 59/45 Moo5 Srisoontorn, Talang, Phuket 83110
Equipment	:	Conductivity
Manufacturer	:	APERA
Model	:	EC 8500
Serial No.	:	EC85001323271005
ID. No.	:	-
Resolution	:	0.1µS/cm, 1µS/cm, 0.01mS/cm
Instrument Condition	:	Good Condition
Location of Calibration	:	Customer Laboratory
Ambient Temperature	:	(25 ± 3) °C
Relative Humidity	:	(55 ± 15) %
Date of Received	:	16-Nov-2023
Date of Calibration	:	16-Nov-2023
Date of Issued	:	20-Nov-2023

COPY

APPROVED BY :

Calibrated By : Mr. Alongkorn Chewaisarakul
(Calibration Technician)

APPROVED SIGNATORY
(/) MR. PIYAPONG RATTANAKAN / Calibration Manager
( ) MR. METHA CHUAIBUN / Quality Manager
( ) MR. BUNPOT SUWANNARAT / Technical Manager

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น.16/106

Equipment : Analyucal Balance
Manufacturer : SATORIUS
Model : BCA224I-1S
Serial No. : 39506504
ID. No. : -
Date of Received : 24-May-2024
Date of Calibration : 24-May-2024

REFERENCE STANDARD INSTRUMENT :

Instrument Type	Norminal Value	Serial No.	Cert. No.	Due Date	Traceability
Standard Weight Set	1 mg ~ 500 g	-	M2311155S	29-11-2024	TCS

CALIBRATION METHOD :

In-house method : CA.WI.11.015 based on UKAS LAB 14 : 2022

TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurment according to the International System of Unit (SI) through :
TCS : Thai Calibration Services Co.,Ltd. , (NSC-TISI-TIS 17025 CALIBRATION 0189)

CALIBRATION RESULTS :

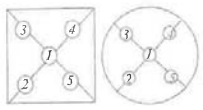
(/) Without Adjustment ( ) After Adjustment

DETERMINATION OF THE STANDARD DEVIATION OF WEIGHT MACHINE (N=10)

Nominal Value (g)	Standard Deviation (g)
200	0.00005

EFFECT OF OFF CENTER LOADING AT 100 g

Position					Maximum Difference (g)
1	2	3	4	5	
100.0001	100.0003	100.0003	100.0002	100.0001	0.00020



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

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NSC-TISI-TIS 17025 CALIBRATION 0024

CALIBRATION CERTIFICATE

CERTIFICATE No. : M24-0704
CSR No. : 240617
Page : 1 of 3

Customer : Southern Thai Consulting Co., Ltd.
59/45 Moo5 Srisoontorn, Talang, Phuket
83110
Equipment : Analytical Balance
Manufacturer : SATORIUS
Model : BCA224I-1S
Serial No. : 39506504
ID. No. : -
Capacity : 220 g
Resolution : 0.0001 g
Instrument Condition : Good Condition
Location of Calibration : Customer Laboratory
Ambient Temperature : (30 ± 10) °C
Relative Humidity : (50 ± 20) %
Barometric Pressure : (1010 ±10) hPa
Date of Received : 24-May-2024
Date of Calibration : 24-May-2024
Date of Issued : 27-May-2024

APPROVED BY :

APPROVED SIGNATORY
( ) MR. PIYAPONG RATTANAKAN , Calibration Manager
( ) MR. BUNPOT SUWANNARAT , Technical Manager

Calibrated By : Mr. Piyapol Rongsawat
(Calibration Technician)

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

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NSC-TISI-TIS 17025 CALIBRATION 0024

CALIBRATION CERTIFICATE

CERTIFICATE No. : T24-1545
CSR No. : 240617

Customer	:	Southern Thai Consulting Co., Ltd. 59/45 Moo5 Srisoontorn, Talang, Phuket 83110
Equipment	:	Water Bath
Manufacturer	:	Memmert
Model	:	WNB 22
Serial No.	:	L519.1143
ID. No.	:	-
Resolution	:	0.1 °C
Instrument Condition	:	Good Condition
Location of Calibration	:	Customer Laboratory
Ambient Temperature	:	(30 ± 10) °C
Relative Humidity	:	(50 ± 20) %
Date of Received	:	24-May-2024
Date of Calibration	:	24-May-2024
Date of Issued	:	27-May-2024

APPROVED BY :

APPROVED SIGNATORY
( ) MR. PIYAPONG RATTANAKAN / Calibration Manager
(✓) MR. BUNPOT SUWANNARAT / Technical Manager

Calibrated By : Mr. Attapol Juntasurat
(Calibration Engineer)

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

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CERTIFICATE NO. : M24-0704
CSR No. : 240617
Page : 3 of 3

Equipment	:	Analytical Balance
Manufacturer	:	SATORIUS
Model	:	BCA224I-1S
Serial No.	:	39506504
ID. No.	:	-
Date of Received	:	24-May-2024
Date of Calibration	:	24-May-2024

CALIBRATION RESULTS : (Cont.)

(/) Without Adjustment ( ) After Adjustment

EFFECT OF TARE AT 100 g

Nominal Value (g)	UUC* Reading (g)	Correction (g)
20	20.0000	-0.00002
40	40.0000	-0.00003
60	60.0000	0.00000
80	79.9999	0.00009
100	100.0000	-0.00002

ERROR OF INDICATION FROM NOMINAL VALUE

Nominal Value (g)	UUC* Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor (k)
* Unload	0.0000	0.00000	0.00014	2.11
0.1	0.1000	0.00000	0.00014	2.11
0.5	0.5000	0.00000	0.00014	2.11
1	1.0000	-0.00001	0.00014	2.11
2	2.0000	-0.00002	0.00014	2.11
5	5.0001	-0.00012	0.00014	2.11
10	10.0001	-0.00009	0.00014	2.11
20	20.0000	-0.00002	0.00014	2.10
40	40.0000	-0.00003	0.00015	2.07
60	60.0001	-0.00010	0.00016	2.05
80	80.0002	-0.00021	0.00018	2.03
100	100.0001	-0.00012	0.00019	2.03
120	120.0000	-0.00003	0.00026	2.02
140	140.0001	-0.00015	0.00026	2.01
160	160.0000	-0.00002	0.00026	2.01
180	180.0001	-0.00014	0.00028	2.01
200	200.0000	-0.00010	0.00029	2.00

UUC : Unit Under Calibration
The table as per (*) marked are not NSC-ONSC accreditation scope.
The uncertainties are for a confidence probability of approximately 95 % .
The above results are valid exclusively for calibration sample as mentioned in the report
This result of calibration was found accurate as shown on date and place of calibration only.
- End -

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Equipment	:	Water Bath
Manufacture	:	Memmert
Model	:	WNB 22
Serial No.	:	L519.1143
ID. No.	:	-
Date of Received	:	24-May-2024
Date of Received	:	24-May-2024

CALIBRATION RESULTS : (Cont.)

(/) Without Adjustment ( ) After Adjustment

Temperature Measurement Accuracy Test

The measurement results of the water bath and associates are reported in the manner as shown below

Cal Point	Measured Standard Temperature (°C) at Spread Locations					Uncertainty
(°C)	#1	#2	#3	#4	#5	(± °C)
95	94.68	94.89	94.82	94.87	94.71	0.35

Water Bath Performance Result

The performance of the water bath are reported as shown below

Cal Point	UUC Setting	UUC Reading	Water Bath Stability	Water Bath Uniformity	Overall Variation
(°C)	(°C)	(°C)	(± °C)	(± °C)	(± °C)
95	95.0	95.0	0.100	0.26	0.45

UUC : Unit Under Calibration
The uncertainty is not combine uniformity of the water bath
The uncertainties are for a confidence probability of approximately 95 % .
The above results are valid exclusively for calibration sample as mentioned in the report.
This result of calibration was found accurate as shown on date and place of calibration only.

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11.16/109

Equipment	:	Water Bath
Manufacturer	:	Memmert
Model	:	WNB 22
Serial No.	:	L519.1143
ID. No.	:	-
Date of Received	:	24-May-2024
Date of Calibration	:	24-May-2024

REFERENCE STANDARD INSTRUMENT :

Instrument Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Digital Thermometer with Sensor	34970 A	MY 44042662	DAT003W/0822	01-08-2024	PSE

CALIBRATION METHOD :

In-house method : CA.WI.11.161 based on ASTM E715 : 80 (re-approved 2022)

TRACEABILITY :

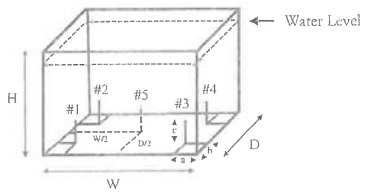
This Calibration Certificate is traceable to national standards which realize the unit of measurment according to the International System of Unit (SI) through :

PSE : Premier System Engineering Co., Ltd. (NSC-TISI-TIS 17025 CALIBRATION 0024)

CALIBRATION RESULTS :

(/) Without Adjustment ( ) After Adjustment

Sensor Installation Diagram



Dimension of the chamber	:	W x H x D	=	35 x 29 x 22 cm
Sensor Installation	:	a x b x c	=	5 x 5 x 5 cm

The uncertainties are for a confidence probability of approximately 95 % .
The above results are valid exclusively for calibration sample as mentioned in the report.
This result of calibration was found accurate as shown on date and place of calibration only.

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PREMIER SYSTEM ENGINEERING CO., LTD.
123 Moo 8 Kanjanavanit Rd., Banpru, Hatyai, Songkhla 90250
E-mail : pse-cal@sritranggroup.com ,Fax. : (074)222912 Tel. : 084-2148162, 084-2148165, 074-222900-9

NSC-TISI-TIS 17025 CALIBRATION 0024

CALIBRATION CERTIFICATE

CERTIFICATE No. : T24-1541
CSR No. : 240613
Page : 1 of 2

Customer	:	Southern Thai Consulting Co., Ltd. 59/45 Moo5 Srisoontorn, Talang, Phuket 83110
Equipment	:	Digital Thermo Hygrometer
Manufacturer	:	DIGICON
Model	:	TH-03A
Serial No.	:	395038423
ID. No.	:	-
Resolution	:	0.1 °C 1 %RH
Instrument Condition	:	Good Condition
Location of Calibration	:	PSE Laboratory
Ambient Temperature	:	(25 ± 3) °C
Relative Humidity	:	(55 ± 15) %
Date of Received	:	20-May-2024
Date of Calibration	:	21-May-2024
Date of Issue	:	24-May-2024

APPROVED BY :

APPROVED SIGNATORY
( ) MR. PIYAPONG RATTANAKAN / Calibration Manager
( ) MR. BUNPOT SUWANNARAT / Technical Manager

Calibrated By : Mr. Attapol Juntasurat
(Calibration Engineer)

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

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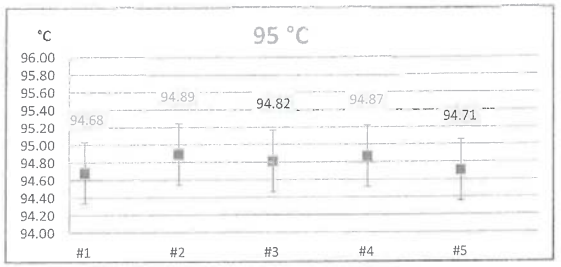
b080723

Report Graph



The above results are valid exclusively for calibration sample as mentioned in the report.
This result of calibration was found accurate as shown on date and place of calibration only.

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E-mail : pse-cal@sritranggroup.com ,Fax. : (074)222912 Tel. : 084-2148162, 084-2148165, 074-222900-9

NSC-TISI-TIS 17025 CALIBRATION 0024

CALIBRATION CERTIFICATE

CERTIFICATE No. : T24-1542
CSR No. : 240613
Page : 1 of 2

Customer	:	Southern Thai Consulting Co., Ltd. 59/45 Moo5 Srisoontorn, Talang, Phuket 83110
Equipment	:	Digital Thermo Hygrometer
Manufacturer	:	ThermoPro
Model	:	TP-50
Serial No.	:	11039
ID. No.	:	-
Resolution	:	0.1 °C 1 %RH
Instrument Condition	:	Good Condition
Location of Calibration	:	PSE Laboratory
Ambient Temperature	:	(25 ± 3) °C
Relative Humidity	:	(55 ± 15) %
Date of Received	:	20-May-2024
Date of Calibration	:	21-May-2024
Date of Issue	:	24-May-2024

APPROVED BY :

APPROVED SIGNATORY
(MR. PIYAPONG RATTANAKAN / Calibration Manager
/ MR. BUNPOT SUWANNARAT / Technical Manager

Calibrated By : Mr. Attapol Juntasurat
(Calibration Engineer)

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

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Equipment	:	Digital Thermo Hygrometer
Manufacturer	:	DIGICON
Model	:	TH-03A
Serial No.	:	395038423
ID. No.	:	
Date of Received	:	20-May-2024
Date of Calibration	:	21-May-2024

REFERENCE STANDARD INTRUMENT :

Instrument Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Relative Hygrometer	DewMaster	53740	TH-0117-23	03/12/2024	NIMT
Digital Thermometer with probe	DewMaster	53740	TT-0134-23	11/12/2024	NIMT

CALIBRATION METHOD :

In-house method : CA.WI.11.174 by comparison with standard thermometer comparison with relative humidity standard

TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurment according to the International System of Unit (SI) through :

NIMT : National Institute of Metrology (Thailand) Ministry of Science and Technology (NSC-TISI-TIS 17025 CALIBRATION 0144)

CALIBRATION RESULTS :

Function : Humidity Measurement

(/) Without Adjustment ( ) After Adjustment

Reference (°C)	STD Humidity (%RH)	UUC* Reading (%RH)	Correction (%RH)	Uncertainty (±%RH)
25	60.41	59.0	1.41	1.8

Function : Temperature Measurement

(/) Without Adjustment ( ) After Adjustment

Cal Point (°C)	STD Temperature (°C)	UUC* Reading (°C)	Correction (°C)	Uncertainty (±°C)
25	24.94	24.7	0.24	0.62

UUC* : Unit Under Calibration
The uncertainties are for a confidence probability of approximately 95 % .
The above results are valid exclusively for calibration sample as mentioned in the report.
This result of calibration was found accurate as shown on date and place of calibration only.
-End-

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E-mail : pse-cal@sritranggroup.com ,Fax. : (074)222912 Tel. : 084-2148162, 084-2148165, 074-222900-9

NSC-TISI-TIS 17025 CALIBRATION 0024

CALIBRATION CERTIFICATE

CERTIFICATE No. : M24-0703
CSR No. : 240613

Customer	:	Southern Thai Consulting Co., Ltd.
		59/45 Moo5 Srisoontorn, Talang, Phuket
		83110
Equipment	:	Weight Set
Manufacturer	:	Mettler Toledo
Norminal Value	:	1g - 200g
Serial No.	:	-
ID. No.	:	PK-LB-48014
Instrument Condition	:	Good Condition
Location of Calibration	:	PSE Laboratory
Ambient Temperature	:	(20 ± 2) °C
Relative Humidity	:	(50 ± 10) %
Barometric Pressure	:	(1010 ±10) hPa
Date of Received	:	20-May-2024
Date of Calibration	:	20-May-2024
Date of Issued	:	23-May-2024

APPROVED BY :

APPROVED SIGNATORY
( ) MR. PIYAPONG RATTANAKAN / Calibration Manager
( ) MR. BUNPOT SUWANNARAT / Technical Manager

Calibrated By : Mr. Piyapol Rongsawat
(Calibration Technician)

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The uncertainties are for a confidence probability of approximately 95 %

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Equipment	:	Digital Thermo Hygrometer
Manufacturer	:	ThermoPro
Model	:	TP-50
Serial No.	:	11039
ID. No.	:	-
Date of Received	:	20-May-2024
Date of Calibration	:	21-May-2024

REFERENCE STANDARD INTRUMENT :

Instrument Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Relative Hygrometer	DewMaster	53740	TH-0117-23	03/12/2024	NIMT
Digital Thermometer with probe	DewMaster	53740	TT-0134-23	11/12/2024	NIMT

CALIBRATION METHOD :

In-house method : CA.WI.11.174 by comparison with standard thermometer comparison with relative humidity standard

TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurment according to the International System of Unit (SI) through :

NIMT : National Institute of Metrology (Thailand) Ministry of Science and Technology (NSC-TISI-TIS 17025 CALIBRATION 0144)

CALIBRATION RESULTS :

Function : Humidity Measurement

(/) Without Adjustment ( ) After Adjustment

Reference (°C)	STD Humidity (%RH)	UUC* Reading (%RH)	Correction (%RH)	Uncertainty (±%RH)
25	60.41	61.0	-0.59	1.8

Function : Temperature Measurement

(/) Without Adjustment ( ) After Adjustment

Cal Point (°C)	STD Temperature (°C)	UUC* Reading (°C)	Correction (°C)	Uncertainty (±°C)
25	24.94	24.8	0.14	0.62

UUC* : Unit Under Calibration
The uncertainties are for a confidence probability of approximately 95 %.
The above results are valid exclusively for calibration sample as mentioned in the report.
This result of calibration was found accurate as shown on date and place of calibration only.
End

COPY

Equipment	:	Weight Set
Manufacturer	:	Mettler Toledo
Norminal Value	:	1g - 200g
Serial No.	:	-
ID. No.	:	PK-LB-48014
Date of Received	:	20-May-2024
Date of Calibration	:	20-May-2024

REFERENCE STANDARD INSTRUMENT :

Instrument Type	Norminal Value/Model	Serial No.	Cert. No.	Due Date	Traceability
Standard Weight Set	1 mg - 1 kg	31930467	M24031475	19-03-2025	TCS

CALIBRATION METHOD :

In-house method : CA.WI.11.052 based on OIML R 111-1 : 2004

TRACEABILITY :

This Calibration Certificate is traceable to national standards which realize the unit of measurment according to the International System of Unit (SI) through :

TCS : Thai Calibration Services Co.,Ltd. , (NSC-TISI-TIS 17025 CALIBRATION 0189)

CALIBRATION RESULTS :

(/) Without Adjustment ( ) After Adjustment

Nominal Value	Marking	Conventional Mass	Uncertainty (± mg)	MPE Class F1
1 g	none	1 g + 0.00 mg	0.03	± 0.10 mg
2 g	none	2 g + 0.02 mg	0.04	± 0.12 mg
2 g		2 g + 0.02 mg	0.04	± 0.12 mg
5 g	none	5 g + 0.02 mg	0.05	± 0.16 mg
10 g	none	10 g + 0.10 mg	0.06	± 0.20 mg
20 g	none	20 g + 0.07 mg	0.08	± 0.25 mg
20 g		20 g + 0.03 mg	0.08	± 0.25 mg
50 g	none	50 g + 0.08 mg	0.10	± 0.3 mg
100 g	none	100 g + 0.12 mg	0.16	± 0.5 mg
200 g	none	200 g + 0.38 mg	0.30	± 1.0 mg

MPE : Maximum permissible errors for weights

The calibration was calibrated by comparison with standard weights at an average air density of 1.2 kg/m^3 and material density for weight of 8,000 kg/m^3

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

The above results are valid exclusively for calibration sample as mentioned in the report.

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

- End -