เอกสารแนบ 16

เอกสารอนุญาตห้องปฏิบัติการ

ค. ขอบข่ายสารมลพิษที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๙ รายการ ตามสิ่งที่ส่งมาด้วย ทั้งนี้ ไม่พิจารณาต่ออายุสารมลพิษในน้ำเสีย จำนวน ๒ รายการ คือ Color และ Manganese เนื่องจากวิธีการทดสอบไม่เป็นไปตามประกาศกระทรวงอุตสาหกรรม เรื่อง กำหนดมาตรฐานควบคุมการระบายน้ำทิ้งจากโรงงาน พ.ศ. ๒๕๖๐

อนึ่ง หากท่านไม่เห็นด้วยกับคำสั่งนี้ ท่านมีสิทธิ์อุทธรณ์คำสั่งต่ออธิบดีกรมโรงงานอุตสาหกรรม กรมโรงงานอุตสาหกรรม เลขที่ ๗๕/๖ ถนนพระรามที่ ๖ แขวงทุ่งพญาไท เขตราชเทวี กรุงเทพมหานคร ภายในสิบห้าวันนับตั้งแต่วันที่ได้รับคำสั่งนี้ (ตามมาตรา ๔๔ แห่งพระราชบัญญัติวิธีปฏิบัติราชการทางปกครอง พ.ศ. ๒๕๓๙)

หนังสือฉบับนี้จะหมดอายุในวันที่ ๑ ธันวาคม ๒๕๖๖ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นอายุของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ซึ่งคำขอต่ออายุดังกล่าวขอรับได้ที่กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นางจินดา เตชะศรินทร์)
ผู้อำนวยการกองวิจัยและเตือนภัยมลพิษโรงงาน
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

กองวิจัยและเตือนภัยมลพิษโรงงาน
ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคใต้
โทร. ๐ ๗๔๓๒ ๕๐๒๙ - ๓๑
ไปรษณีย์อิเล็กทรอนิกส์ sirw@diw.mail.go.th

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นายพิมุข สอนมี
กรรมการบริษัทฯ

ที่ อก ๐๓๑๐(๕)/ ๒๖๘

กรมโรงงานอุตสาหกรรม
ถนนพระรามที่ ๖ เขตราชเทวี
กรุงเทพมหานคร ๑๐๔๐๐

๐๘ มกราคม ๒๕๖๔

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท เซ้าเทิร์นไทยคอนซัลติ้ง จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๒ พฤศจิกายน ๒๕๖๓

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน บริษัท เซ้าเทิร์นไทยคอนซัลติ้ง จำกัด จำนวน ๑ แผ่น

ตามหนังสือที่อ้างถึง บริษัท เซ้าเทิร์นไทยคอนซัลติ้ง จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ว-๑๗๖ สถานที่ตั้งเลขที่ ๕๙/๔๕ หมู่ที่ ๕ ตำบลศรีสุนทร อำเภอถลาง จังหวัดภูเก็ต ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท เซ้าเทิร์นไทยคอนซัลติ้ง จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก.ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์

๑) นายพิมุข สอนมี	ทะเบียนเลขที่	ว-๑๗๖-ค-๓๘๓๕
๒) นายศิริพงศ์ พะสริ	ทะเบียนเลขที่	ว-๑๗๖-ค-๓๘๓๖
๓) นางเพ็ญนภา จันทร์เพ็ญ	ทะเบียนเลขที่	ว-๑๗๖-ค-๕๐๒๗
๔) นางสาวพรรวิษา จินรัตน์	ทะเบียนเลขที่	ว-๑๗๖-ค-๗๔๔๔

ข.เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์

๑) นางสาวกรรณิกา แก้วสามเขียว	ทะเบียนเลขที่	ว-๑๗๖-จ-๕๐๒๘
๒) นางสาวศิริรัตน์ นิเทศนพกุล	ทะเบียนเลขที่	ว-๑๗๖-จ-๕๐๓๑
๓) นางสาวมัทติกา รุ่งเรือง	ทะเบียนเลขที่	ว-๑๗๖-จ-๖๒๐๑
๔) นางสาวจุฑาทิพย์ ชูถึง	ทะเบียนเลขที่	ว-๑๗๖-จ-๖๒๐๓
๕) นางสาวปรีชญา หมุกแก้ว	ทะเบียนเลขที่	ว-๑๗๖-จ-๗๔๔๕
๖) นางสาวบุษยา ประกอบแสง	ทะเบียนเลขที่	ว-๑๗๖-จ-๗๔๔๖
๗) นางสาวจุฑาภรณ์ จุฑามาตย์	ทะเบียนเลขที่	ว-๑๗๖-จ-๗๔๔๘
๘) นายพีรพล ธรรมสิริกุลกิจ	ทะเบียนเลขที่	ว-๑๗๖-จ-๗๔๔๙
๙) นางสาวชลณพร เอียดนุช	ทะเบียนเลขที่	ว-๑๗๖-จ-๙๑๘๖
๑๐) นางสาวกรรณนิการ์ ประทุมเพชร	ทะเบียนเลขที่	ว-๑๗๖-จ-๙๑๘๗

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กรรมการบริษัทฯ

ค. ขอบข่าย...

ANALYTICAL BALANCE (DU)

Model : XS205 DU

Serial No. : 1126323724

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท เซ้าเทิร์นไทยคอนซัลติ้ง จำกัด เลขทะเบียน ว-๑๗๖
ที่ อก ๐๓๑๐(๕)/ ๒๖๘ ลงวันที่ ๐๘ มกราคม ๒๕๖๔

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 and 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 Method
9	Total Suspended Solids	Dried at 103-105 °C

เอกสารอ้างอิง

APHA, AWWA, WEF. **Standard Methods for the Examination of Water and Wastewater**. 23rd ed. Washington, DC: APHA, 2017.

(นายนเรศวร์ ตรียงค์)
ผู้อำนวยการศูนย์วิจัยและเตือนภัย
มลพิษโรงงานภาคใต้

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กรรมการบริษัทฯ

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Calibration Certificate ID
TH4004-018-020722-ACC-TH

METTLER TOLEDO

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

NSC-TISI-TIS 17025
CALIBRATION 0082

Accuracy Calibration Certificate

Customer

Company:	EASTERN THAI CONSULTING 1992 CO., LTD.		
Address:	883 Moo 11, Sukhaphiban 8 Rd., Nong Kham		
City:	Sriracha	**Contact:**	Sasiporn Nakin
Zip / Postal:	20230		
State / Province:	Chonburi		
Order Number:			

Weighing Device

Manufacturer:	Mettler Toledo	**Instrument Type:**	Weighing Instrument
Model:	XS205DU	**Asset Number:**	LABE 05/1
Serial No.:	1126323724	**Terminal Model:**	SAT
Building:	Laboratory	**Terminal Serial No.:**	1126323724
Floor:	1	**Terminal Asset No.:**	N/A
Room:	Laboratory		

Range	Max. Capacity	Readability (d)
1	81 g	0.00001 g
2	220 g	0.0001 g

Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CP/W002/20

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.

The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.

In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature		Humidity	
As Found	Start: 24.9 °C	End: 25.7 °C	Start: 54.0 %	End: 51.3 %

As Found Calibration Date: 07-Feb-2022
As Left Calibration Date: N/A
Issue Date: 08-Feb-2022

Calibrator: Sathaporn T
Sathaporn Tabsen

Approved Signatory:
☑ Kessakorn Tassanachaisakul
☐ Santi Jitniyom
☐ Surachet Sukkate

Software Version: 1.23.0.260
Report Version: 2.16.0
Form Number: F103C

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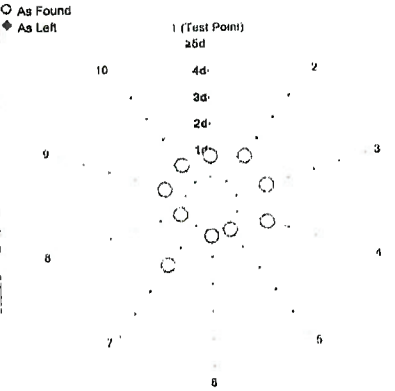
Calibration Certificate ID
TH4004-018-020722-ACC-TH

Measurement Results

Repeatability

Test Load: 70 g

	As Found	As Left
1	70.00002 g	N/A
2	70.00004 g	N/A
3	70.00004 g	N/A
4	70.00004 g	N/A
5	70.00003 g	N/A
6	70.00003 g	N/A
7	70.00001 g	N/A
8	70.00003 g	N/A
9	70.00002 g	N/A
10	70.00002 g	N/A
Standard Deviation	0.000010 g	N/A



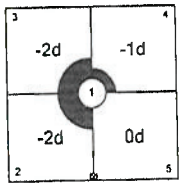
The "d" in the graph represents the readability of the range/interval in which the test was performed.

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

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0000 g	N/A
2	99.9998 g	N/A
3	99.9998 g	N/A
4	99.9999 g	N/A
5	100.0000 g	N/A
Maximum Deviation	0.0002 g	N/A



As Found

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

Software Version: 1.23.0.260
Report Version: 2.16.0
Form Number: F103C

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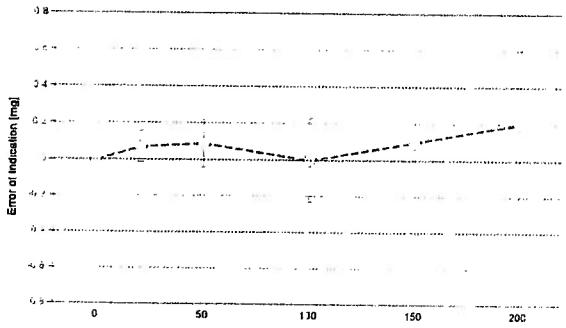
Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.021 mg	2
2	0.01000 g	0.01002 g	0.00002 g	0.023 mg	2
3	0.10000 g	0.10002 g	0.00002 g	0.026 mg	2
4	1.00000 g	1.00000 g	0.00000 g	0.035 mg	2
5	4.99999 g	4.99999 g	0.00000 g	0.050 mg	2
6	10.00002 g	10.00005 g	0.00003 g	0.063 mg	2
7	19.99994 g	20.00001 g	0.00007 g	0.085 mg	2
8	49.99997 g	50.00006 g	0.00009 g	0.13 mg	2
9	100.0000 g	100.0000 g	0.0000 g	0.23 mg	2
10	149.9999 g	150.0000 g	0.0001 g	0.35 mg	2
11	200.0000 g	200.0002 g	0.0002 g	0.42 mg	2



○ As Found

◆ As Left

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

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

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

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.:	WS32	Date of Issue:	15-Sep-2020
Certificate Number:	169521	Calibration Due Date:	13-Mar-2022

Thermo Baro Hygrometer

Equipment No.:	IN74	Date of Issue:	09-Jul-2021
Certificate Number:	21H1470	Calibration Due Date:	28-Jun-2022

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Remarks

FACT adjustment functionality activated

Equipment condition: Good

Next calibration according to customer's procedure

End of Accredited Section

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

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Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with k=2 in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $1.5 \cdot 10^{-6}$ / K

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

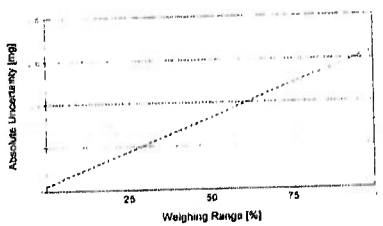
Linearization of Uncertainty Equation

	Range		As Found	As Left
	d	Max		
1	0.00001 g	81 g	$U_1 = 0.022\ mg + 0.00763\ mg/g \cdot R$	N/A
2	0.0001 g	220 g	$U_2 = 0.08\ mg + 0.00762\ mg/g \cdot R$	N/A

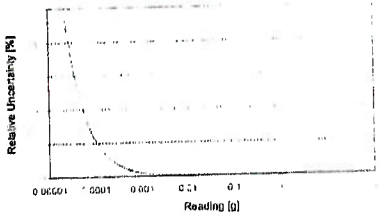
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
0.00220 g	0.022 mg	1.0%	N/A	N/A
0.02200 g	0.022 mg	0.10%	N/A	N/A
0.22000 g	0.024 mg	0.011%	N/A	N/A
2.20000 g	0.039 mg	0.0018%	N/A	N/A
220.0000 g	1.7 mg	0.00079%	N/A	N/A



As Found



As Left

The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.

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9.16/5

GWP® Certificate

As Found ✓

The weighing device meets the given process requirements.

As Left ✓

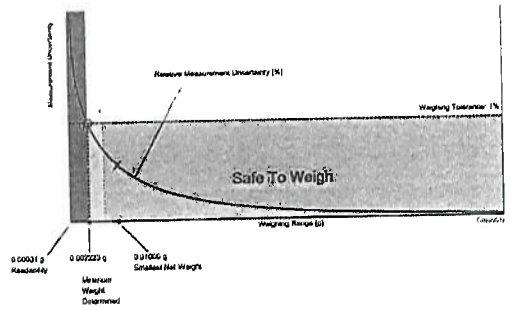
The weighing device meets the given process requirements.

Tests Performed: ☑ As Found ☐ As Left ☑ No adjustments/modifications made. As Left results correspond to As Found.

Process Requirements

Weighing Tolerance: 1% | Smallest Net Weight: 0.01000 g | Safety Factor: 2

Safe Weighing Range



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

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Minimum Weight

As Found Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.022382 g	0.045110 g	0.068193 g	0.115457 g	0.240445 g
0.2%	0.011148 g	0.022382 g	0.033702 g	0.056607 g	0.115457 g
0.5%	0.004449 g	0.008912 g	0.013388 g	0.022382 g	0.045110 g
1%	0.002223 g	0.004449 g	0.006679 g	0.011148 g	0.022382 g
2%	0.001111 g	0.002223 g	0.003335 g	0.005563 g	0.011148 g
5%	0.000444 g	0.000889 g	0.001333 g	0.002223 g	0.004449 g

The minimum weight table applies to the fine range of the weighing device.

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

As Left Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.022382 g	0.045110 g	0.068193 g	0.115457 g	0.240445 g
0.2%	0.011148 g	0.022382 g	0.033702 g	0.056607 g	0.115457 g
0.5%	0.004449 g	0.008912 g	0.013388 g	0.022382 g	0.045110 g
1%	0.002223 g	0.004449 g	0.006679 g	0.011148 g	0.022382 g
2%	0.001111 g	0.002223 g	0.003335 g	0.005563 g	0.011148 g
5%	0.000444 g	0.000889 g	0.001333 g	0.002223 g	0.004449 g

The minimum weight table applies to the fine range of the weighing device.

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

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with k = 2 and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

Notes on minimum weight values in above table:

1. If "N/A" is shown above, no appropriate value could be calculated.
2. METTLER TOLEDO is not responsible for the definition of the process requirements.

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Measurement Results

Results Summary

	Repeatability	Eccentricity	Error of Indication
As Found	✓	✓	✓
As Left	✓	✓	✓

✓ = Passed
✗ = Failed
⚠ = Safety Factor not met

Repeatability

Test Load: 70 g

		As Found		As Left	
Tolerance	Control Limit	Std. Deviation	Result	Std. Deviation	Result
0.1%	0.000005 g	0.000010 g	✗	0.000010 g	✗
0.2%	0.000010 g		✓		⚠
0.5%	0.000025 g		✓		✓
1%	0.000050 g		✓		✓
2%	0.000100 g		✓		✓
5%	0.000250 g		✓		✓

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

Eccentricity

Test Load: 100 g

		As Found		As Left	
Tolerance	Control Limit	Deviation	Result	Deviation	Result
0.1%	0.0500 g	0.0002 g	✓	0.0002 g	✓
0.2%	0.1000 g		✓		✓
0.5%	0.2500 g		✓		✓
1%	0.5000 g		✓		✓
2%	1.0000 g		✓		✓
5%	2.5000 g		✓		✓

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

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Attachment to Calibration Certificate:
TH4004-018-020722-ACC-TH
GWP® Certificate

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Error of Indication

As Found

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
19.99994 g	0.00007 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g
49.99997 g	0.00009 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
100.0000 g	0.0000 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
149.9999 g	0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0000 g	0.0002 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

As Left

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
19.99994 g	0.00007 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g
49.99997 g	0.00009 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
100.0000 g	0.0000 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
149.9999 g	0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0000 g	0.0002 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.

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Service Date: 2022-02-07
Document Number: TH4004-529-020722-LABBalanceHR

METTLER TOLEDO

EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhaphiban 8 Rd., Nong Kham, Sriracha, Chonburi 20230
Khun Sasiporn Nakin

Balance Health Report

Device Details

System Details			
Manufacturer:	Mettler Toledo	Accessory 1:	Other
Model:	XS205DU	Accessory 2:	
Serial number:	1126323724	Weight set for routine testing:	No
Firmware:	4.0		

History

Device History		Service History	
Instrument in use:	Yes	Last preventive maintenance:	< 1 year
Instrument age:	3-10 years	Last instrument calibration:	< 1 year
Spare parts available:	Yes	Last minimum weight determination:	Never
Regulations:	ISO		
Process tolerance in %:	1 %	Routine testing performed:	Don't know
Smallest sample net weight:	0.0100 g		

Check List

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

Recommendations

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

Contact	Name:	Khun Sasiporn Nakin	Position:	Document Control	Phone:	096-051-3303	Email:	dc_lab@etc1992.com

Additional Remarks & Recommendations	Engineer Details
	Date: 07-Feb-2022 Name: Salthaporn Tabsen Signature:

This is not a certificate.
It should not be used to interpret final results for the testing of those devices.

Legend: ✓ Good/Pass ! Needs Attention ✗ Bad/Fail – Not Applicable

84/4 - 84/5 Lasalle Rd , Bangna Tai Sub-District, Bangna District, Bangkok 10260, +66 2723 0382
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ATOMIC ABSORPTION SPECTROPHOTOMETER

Varian Model : Spectr AA-240FS

Serial No. : EL07053792

CERTIFICATE OF INTERNAL CALIBRATION

NOMENCLATURE: 1. Atomic Absorption Spectrophotometer "VARIAN"
Model Spectr AA – 240FS S/N EL07053792

1. Working standard solution "MERCK"

Chromium	Lot No.	HC99974679	Expire date	June 2022
Copper	Lot No.	HC90773586	Expire date	December 2022
Nickel	Lot No.	HC90700592	Expire date	September 2022
Iron	Lot No.	HC02468981	Expire date	June 2024
Lead	Lot No.	HC91308676	Expire date	December 2022

CALIBRATION PROCEDURE: WI-LAB-020 Internal Calibration Method of AAS

REFERANCE STANDARD Reference Material traceable to NIST "AccuStandard"

Copper	Lot No.	220115154	Expire date	December 2022
Nickel	Lot No.	220115154	Expire date	December 2022
Iron	Lot No.	220115154	Expire date	December 2022
Chromium	Lot No.	220115154	Expire date	December 2022
Lead	Lot No.	220115154	Expire date	December 2022

CALIBRATION RANGE: 0.10, 0.25, 0.50, 1.00, 2.00 mg/l at 217.0, 232.0, 248.3, 324.8 and 357.9 nm

AMBIENT CONDITION: Temperature 25.0 ± 5.0 °C
Relative Humidity 60.0 ± 15 %RH

The Testing Laboratory has calibrated Atomic Absorption Spectrophotometer set against Reference Material (RM) traceable to National Institute of Standard and Technology (NIST). The result are attached herewith

Examined by .....
(Mr. CHANNARONG TANGTHAMMARAK)
SCIENTIST

Approved by .....
(MR. KAWEE SUTHASUB)
TESTING DEPARTMENT MANAGER
Issue Date: January 05, 2022

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INTERNAL CALIBRATION REPORT

NOMENCLATURE: 1. Atomic Absorption Spectrophotometer "VARIAN"
Model Spectra AA – 240FS S/N EL07053792

2. Working standard solution "MERCK"

Chromium	Lot No.	HC99974679	Expire date	June 2022
Copper	Lot No.	HC90773586	Expire date	December 2022
Nickel	Lot No.	HC90700592	Expire date	September 2022
Iron	Lot No.	HC02468981	Expire date	June 2024
Lead	Lot No.	HC91308676	Expire date	December 2022

CALIBRATED DATE: January 05, 2022

CALIBRATE BY: Mr.Channarong Tungthammarak

CALIBRATION PROCEDURE: WI-LAB-020 Internal Calibration Method of AAS

CALIBRATION RANGE: 0.10, 0.25, 0.50, 1.00, 2.00 mg/l at 217.0, 232.0, 248.3, 324.8 and 357.9 nm

AMBIENT CONDITION: Temperature 25.0 ± 5.0 °C
Relative Humidity 60.0 ± 15 %RH

CALIBRATION DATA

1. **Noise Level in term of Standard Deviation**

Standard	Chromium	Copper	Nickel	Iron	Lead
Deviation	0.00025	0.00006	0.00041	0.00057	0.00020

2. **Repeatability**

	Concentration of Standard (mg/l)								
	Chromium			Copper			Nickel		
	0.10	0.50	2.00	0.10	0.50	2.00	0.10	0.50	2.00
Standard Deviation	0.00015	0.00014	0.00137	0.00011	0.00041	0.08000	0.00031	0.00049	0.00053
Average Absorbance	0.0078	0.0389	0.1484	0.0133	0.0654	0.2530	0.0090	0.0469	0.1794

	Concentration of Standard (mg/l)					
	Iron			Lead		
	0.10	0.50	2.00	0.10	0.50	2.00
Standard Deviation	0.00028	0.00058	0.00101	0.00020	0.00018	0.00064
Average Absorbance	0.0078	0.0389	0.1531	0.0042	0.0188	0.0698

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BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41

9.16/10

3. **Reading on Wavelength – Chromium at 357.9 nm**

Standard Value of RM (mg/l)		Reading (mg/l)	Error of measurement (mg/l)	Uncertainty (mg/l)
Cr	0.100	0.081	-0.019	± 0.006
	0.500	0.468	-0.032	± 0.025
	2.000	1.874	-0.126	± 0.106

4. **Reading on Wavelength – Copper at 324.8 nm**

Standard Value of RM (mg/l)		Reading (mg/l)	Error of measurement (mg/l)	Uncertainty (mg/l)
Cu	0.100	0.096	-0.004	± 0.005
	0.500	0.514	+0.014	± 0.026
	2.000	2.048	+0.048	± 0.104

5. **Reading on Wavelength – Nickel at 232.0 nm**

Standard Value of RM (mg/l)		Reading (mg/l)	Error of measurement (mg/l)	Uncertainty (mg/l)
Ni	0.100	0.092	-0.008	± 0.016
	0.500	0.511	+0.011	± 0.032
	2.000	1.962	-0.038	± 0.099

6. **Reading on Wavelength – Iron at 248.3 nm**

Standard Value of RM (mg/l)		Reading (mg/l)	Error of measurement (mg/l)	Uncertainty (mg/l)
Fe	0.100	0.099	-0.001	± 0.014
	0.500	0.510	+0.010	± 0.029
	2.000	1.996	-0.004	± 0.105

7. **Reading on Wavelength – Lead at 217.0 nm**

Standard Value of RM (mg/l)		Reading (mg/l)	Error of measurement (mg/l)	Uncertainty (mg/l)
Pb	0.100	0.097	-0.003	± 0.013
	0.500	0.519	+0.019	± 0.031
	2.000	2.084	+0.084	± 0.114

Examined by .....

(Mr. CHANNARONG TANGTHAMMARAK)

SCIENTIST

Approved by .....

(MR. KAWEE SUTHASUB)

TESTING DEPARTMENT MANAGER

Issue Date: January 05, 2022

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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. : AD2205-163-0001
Date Issued : 20-May-22

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 : 12-May-22
Date Calibrated : 20-May-22

Calibrated by : Mr. Saruth Srichutikul

Calibration Method or Calibration Procedure Used

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

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

Result of Calibration

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

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Approved by: K. Nathong
(Mr. Nathapong Krudaum)

CERTIFIED MIT

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Certificate No : AD2205-163-0001

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

STD Reading hPa	UUC Reading (hPa) Before Adjusted	UUC Reading (hPa) After Adjusted	UUC Error hPa	Uncertainty ± hPa
990.00	990.0	-	0.00	0.59
1000.00	1000.0	-	0.00	0.59
1010.00	1010.0	-	0.00	0.59
1020.00	1020.0	-	0.00	0.59
1030.00	1030.0	-	0.00	0.59

STD = Standard

UUC = Unit Under Calibration

Calibrated condition :
Pressure Medium: Air : Density = 1.19 kg/m³ @ 20°C, 1 bar
Mounting Position: Vertical
Reference Level: at center of its dial

Description of UUC :
Range: 955 - 1075 hPa Absolute
Calibration Range: 990 - 1030 hPa Absolute
Scale Interval: 1 hPa
Resolution: 0.5 hPa Absolute

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-P210086 for Reference Pressure Monitor Serial No. 1598, Due 08-Nov-22

End of Certificate

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Hot Air Oven

Model : UM 400

Serial No. : 900982

AMARC | ASIA MEDICAL AND AGRICULTURAL LABORATORY AND RESEARCH CENTER

ilac-MRA THAILAND NSC-TISI-TIS17025 CALIBRATION 0152

CERTIFICATE OF CALIBRATION

Certificate No. : 22-025399

Sample Code : 22-09604-002

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 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 : 11 March 2022 Date of Calibration : 11 March 2022

Condition of Calibration

1. Environment
   - 1.1 Ambient temperature : Maximum 28.7 °C ; Minimum 27.4 °C
   - 1.2 Relative humidity : Maximum 61.5 % ; Minimum 55.8 %
   - 1.3 Line voltage supplied : Maximum 226.5 VAC ; Minimum 224.7 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-11 (RTD-138 to RTD-146)	21-035792	18 May 2022

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. Natthanan Phosri
Scientist

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

Issue date : 14 March 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).

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

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AMARC | ASIA MEDICAL AND AGRICULTURAL LABORATORY AND RESEARCH CENTER

ilac-MRA THAILAND NSC-TISI-TIS17025 CALIBRATION 0152

REPORT OF CALIBRATION

Certificate No. : 22-025399

Sample Code : 22-09604-002

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		
85	85.0	85.0	85.05	84.99	84.66	84.71	84.85	84.92	84.96	84.86	84.98	0.25	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
85	0.08	0.35	0.54

Notes

- UUC* = Unit Under Calibration

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Phlabphla, Wang Thonglang, Bangkok 10310
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FAX 02-516-6949
CONTACT@AMARC.CO.TH
WWW.AMARC.CO.TH

REPORT OF CALIBRATION

Certificate No. : 22-025399

Sample Code : 22-09604-002

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 ".

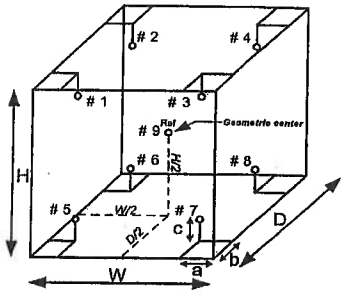

Figure: Example of sensor installation Positions

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 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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