

ภาคผนวก ง.

เอกสารผลการสอบเทียบเครื่องมือตรวจวัด

ประจำเดือนกุมภาพันธ์ พ.ศ. 2566



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CH1650

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Certificate of Calibration

Equipment :	pH Meter
Manufacturer :	Mettler Toledo
Model :	Five Easy
Serial No. :	B617389478
ID No. :	PH-02
Condition As-Received:	Used Item
Received Date :	29 November 2022
Calibration Date :	30 November 2022
Reference :	2211-1001WN-1
Submitted by :	Hi-Tech Utilities Corp.,Ltd. 61 Moo 1 Tambol Banlen, A.Bangpa-In, Ayutthaya 13160
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure :	In - house method : - CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM) - CP-CH8 by comparison with standard thermometer

Calibrated by : Walalak Sirithean

Approved by :


Approved Signatory

- (☒) Malee Butkruea
(☐) Saithip Meangmai
(☐) Warakorn Lerngagtrakul

Issue Date : 1 December 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0048267



Cert.No.: 22CH1650

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Condition of this calibration result

1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023
2) Ref. Standard Thermometer	4982054	110RC044	22I1306	27 Oct 2023

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

- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	823320	20 June 2024
pH 6.987	CPA chem	823322	20 June 2023
pH 10.008	CPA chem	826590	09 July 2023

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: B617389478	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.01	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00

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Cert.No.: 22CH1650

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Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode S/N.: 2255776	4.008	4.02	173	0.0086	2.05
	6.987	6.99	2	0.011	2.00
	10.008	10.01	-172	0.0096	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : LE438
- Serial No. : 2255776

Dimension of probe;

- Length : 12 mm.
- Diameter : 120 mm.
- Immersion Depth : 100 mm.

Calibration Point ($^{\circ}\text{C}$)	Standard Temperature ($^{\circ}\text{C}$)	UUC* Reading ($^{\circ}\text{C}$)	Error ($^{\circ}\text{C}$)	Uncertainty of measurement (\pm $^{\circ}\text{C}$)	Coverage factor k
25.0	25.000	25.1	0.100	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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Certificate of Calibration

Equipment:	Cooled Incubator	Certificate No.:	C31221188
Model:	i250	Issued Date:	20 June 2022
Serial No.(or ID):	0408-0215-0017 (CI-01)	Job No.:	KSPR2207301
Manufacturer:	Accuplus	Page:	1 of 4
Condition:	In Condition	Ventilation Valve:	None
Shelves(pc.):	4		

Customer: ECO CONSULTANT COMPANY LIMITED.
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Environment Condition:

Temperature:	26 °C	±	0.9 °C
Humidity:	60 %RH	±	4.2 %RH
Voltage:	223 VAC	±	3.4 VAC

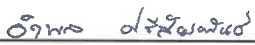
Calibration Place: ECO CONSULTANT COMPANY LIMITED. (ห้องปฏิบัติการวิเคราะห์ ชั้น 2)
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Calibration By: Mr. Ampol Srisumphan

Calibration Date: 17 June 2022


The Method used: In house method, SPCC-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C10220004


(Mr. Ampol Srisumphan)

Person in charge


บริษัท เอสพีซี อาร์ที จำกัด
SPC RT Co., Ltd.

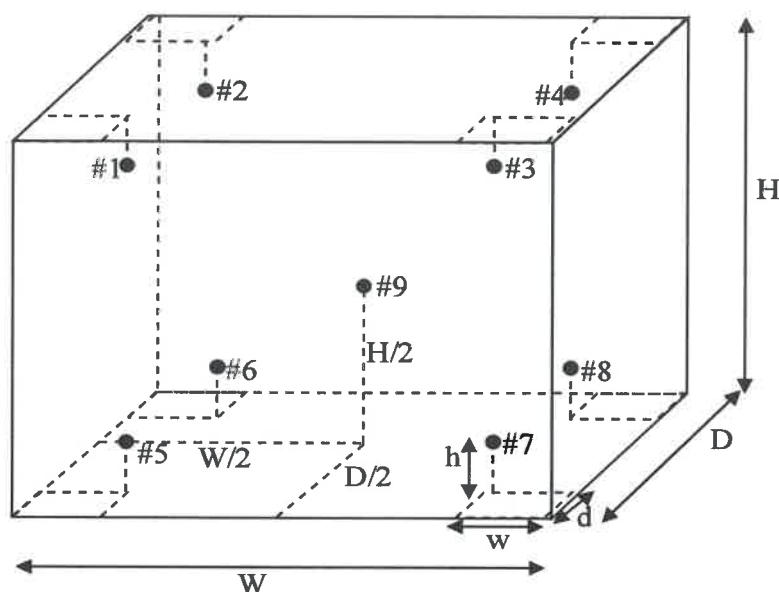

(Mr. Udon Srichana)

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 SPC RT Co., Ltd.



Standard Installation Locations

Volume (Calibration Zone)= 102 (Liters)

Inside chamber:	W = 50 (cm)	D = 44 (cm)	H = 119 (cm)
Standard Locations (#1, #2, #3, #4):	w = 5 (cm)	d = 5 (cm)	h = 32 (cm)
Standard Locations (#5, #6, #7, #8):	w = 5 (cm)	d = 5 (cm)	h = 12 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	1	2	3	4	5	6	7	8	9

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

Certificate No.: C31221188

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Calibration Results:**Without adjustment**

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 2.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	4.26	2.26	0.51
#2	3.51	1.51	0.52
#3	2.60	0.60	0.52
#4	2.73	0.73	0.51
#5	3.29	1.29	0.51
#6	2.80	0.80	0.51
#7	2.41	0.41	0.51
#8	2.64	0.64	0.51
#9	2.32	0.32	0.51

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
3.0	2.0	2.0	4.26	3.51	2.60	2.73	3.29	2.80	2.41	2.64	2.32	0.52

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
2.0	2.01	0.13	2.09

Note: * Maximum uncertainty of the each position

Certificate No.: C31221188

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Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	20.68	0.68	0.34
#2	20.37	0.37	0.33
#3	19.98	-0.02	0.45
#4	20.15	0.15	0.35
#5	20.16	0.16	0.36
#6	20.14	0.14	0.36
#7	19.84	-0.16	0.35
#8	19.84	-0.16	0.38
#9	19.80	-0.20	0.39

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
20.0	20.0	20.0	20.68	20.37	19.98	20.15	20.16	20.14	19.84	19.84	19.80	0.45

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
20.0	0.95	0.30	1.27

Note: * Maximum uncertainty of the each position

The End of Certificate

Certificate No.: C31221188 Page: 1 of 2

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :** ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA
- ☒ Choice B Non-binary statement with guard band ($w = 1 U$), Specific Risk < 2.5% PFA
- ☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r U$) .
- ; PFA – Probability of False Accept




(Mr. Udon Srichana)

Authorized signatory

Without adjustment

Desired Temperature : 3.0°C Tolerances : 3.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 2.0 °C

Locations	Measured (°C)	Correction of UUC. (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	4.26	1.26	0.51	3.0	Pass
#2	3.51	0.51	0.52	3.0	Pass
#3	2.60	-0.40	0.52	3.0	Pass
#4	2.73	-0.27	0.51	3.0	Pass
#5	3.29	0.29	0.51	3.0	Pass
#6	2.80	-0.20	0.51	3.0	Pass
#7	2.41	-0.59	0.51	3.0	Pass
#8	2.64	-0.36	0.51	3.0	Pass
#9	2.32	-0.68	0.51	3.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

Certificate No.: C31221188 Page: 2 of 2

Statements of conformity:(Cont.)**Without adjustment (Cont.)**

Desired Temperature : 20.0°C Tolerances : 3.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured (°C)	Correction of UUC.* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	20.68	0.68	0.34	3.0	Pass
#2	20.37	0.37	0.33	3.0	Pass
#3	19.98	-0.02	0.45	3.0	Pass
#4	20.15	0.15	0.35	3.0	Pass
#5	20.16	0.16	0.36	3.0	Pass
#6	20.14	0.14	0.36	3.0	Pass
#7	19.84	-0.16	0.35	3.0	Pass
#8	19.84	-0.16	0.38	3.0	Pass
#9	19.80	-0.20	0.39	3.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

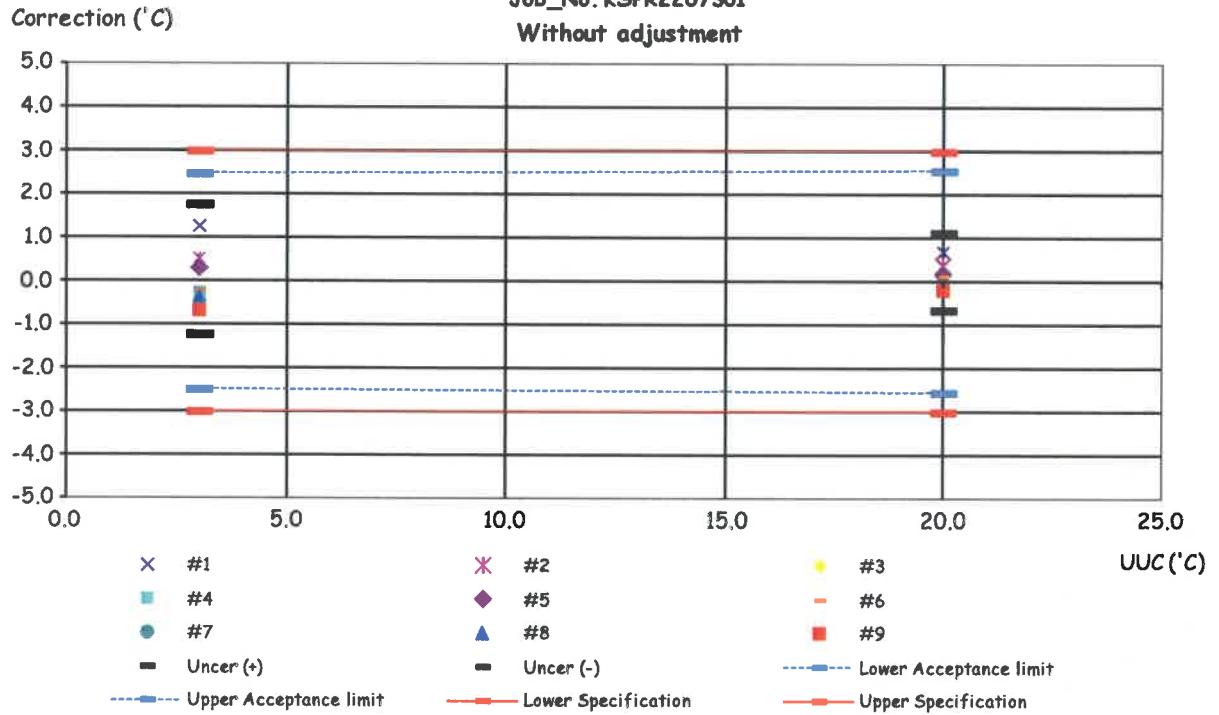
The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity

Corr_Distribution & Max_Measurement Uncertainty

Job_No. KSPR2207301

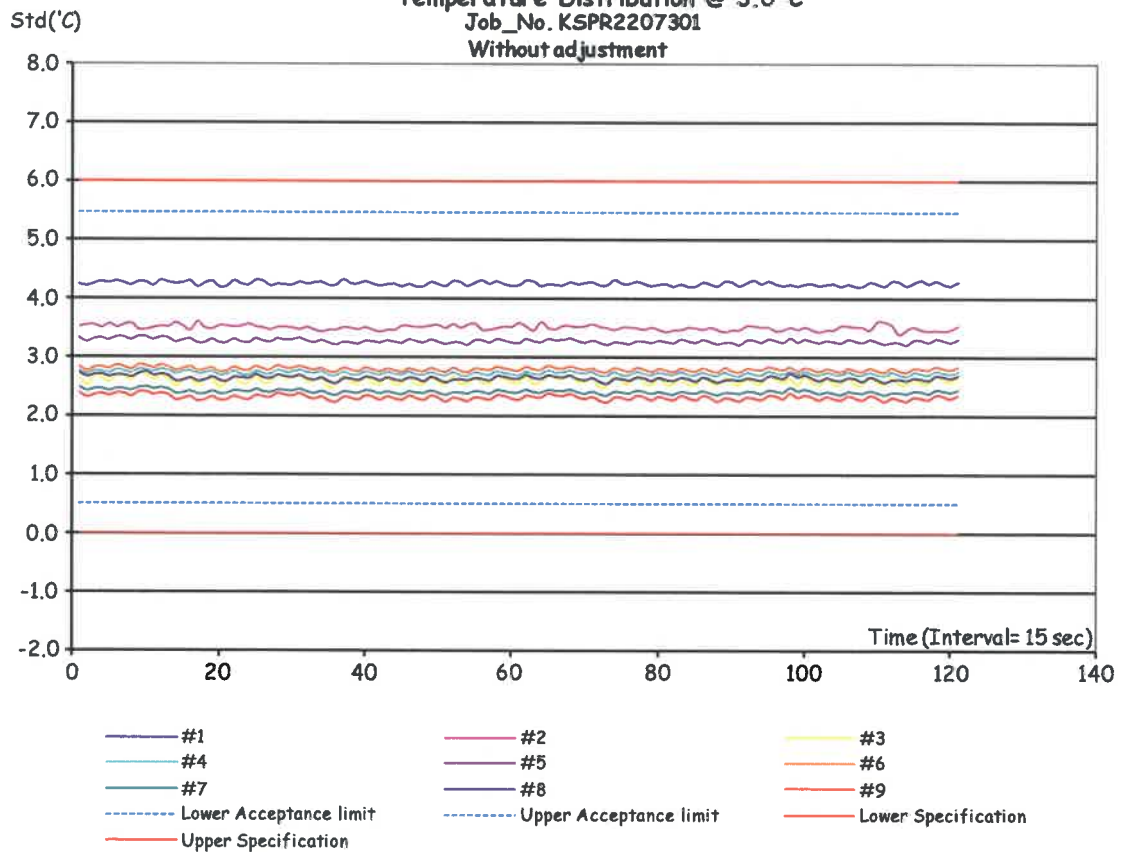
Without adjustment



Temperature Distribution @ 3.0°C

Job_No. KSPR2207301

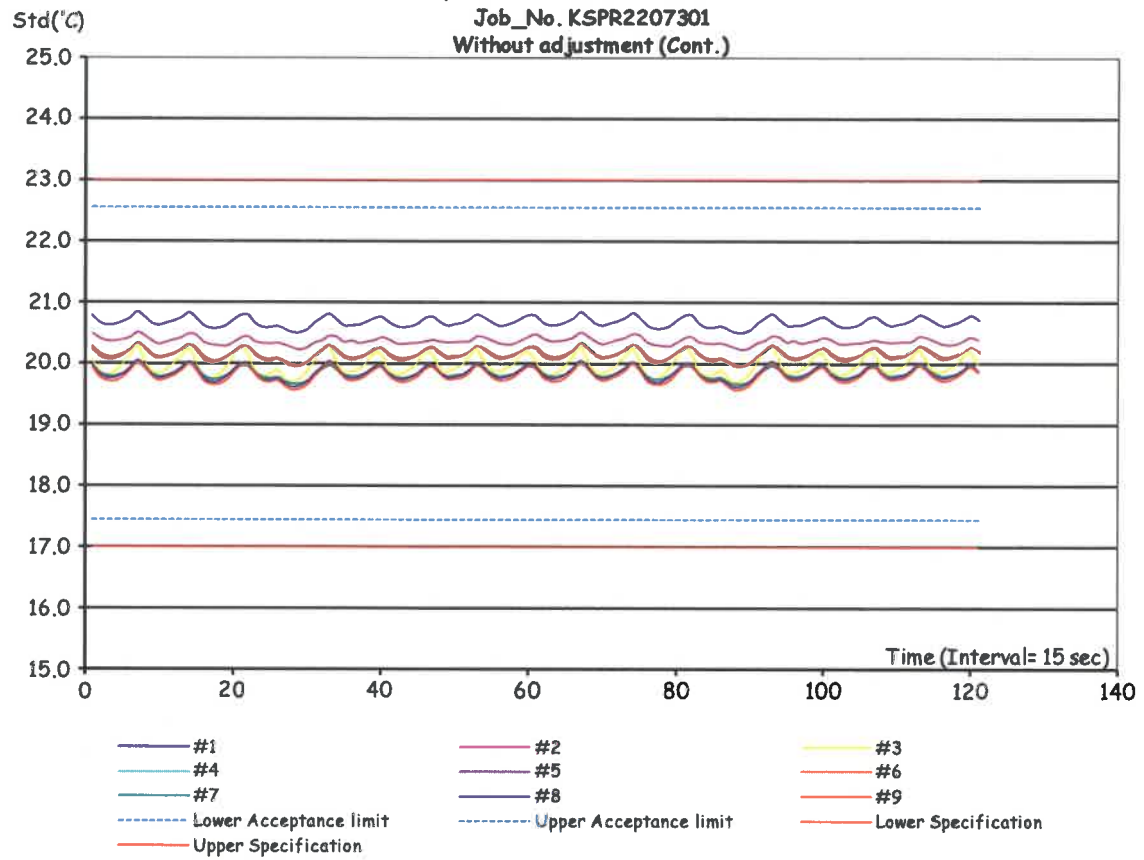
Without adjustment



Temperature Distribution @ 20.0°C

Job_No. KSPR2207301

Without adjustment (Cont.)



ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2207301

ชนิดเครื่องมือ: Cooled Incubator

รุ่น: i250

หมายเลขเครื่อง: 0408-0215-0017 (CI-01)

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
17 Jun 2022			17 Jun 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Ampol Srisumphan

Service Engineer



Certificate of Calibration

Equipment:	Balance	Certificate No.:	C01223748
Model:	PA214	Issued Date:	10 December 2022
Serial No. (or ID.):	B416510537 (BA-02)	Job No.:	KSPR2215298
Manufacturer:	Ohaus	Page:	1 of 3
Condition:	In condition		

Customer: ECO CONSULTANT COMPANY LIMITED.
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Environment Condition: Temperature 23 °C ± 0.6 °C
Humidity 62 %RH ± 3.4 %RH

Calibration Place: ECO CONSULTANT COMPANY LIMITED. (ห้องเครื่องชั่ง)
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Calibration By: Mr. Atachai Ngamchanat

Calibration Date: 09 December 2022

The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02221865



(Mr. Atachai Ngamchanat)

Person in charge



(Mr. Rungrod Jenkitrakulchai)

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.

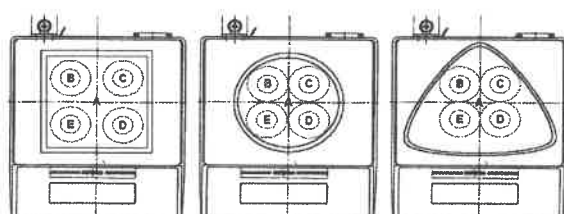
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

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.

Calibration Results:

Before Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

			Nominal Test Value		100	(g)
Reference Points (g)						
A	B	C	D	E		
-	0.0000	-0.0001	0.0001	0.0001		

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

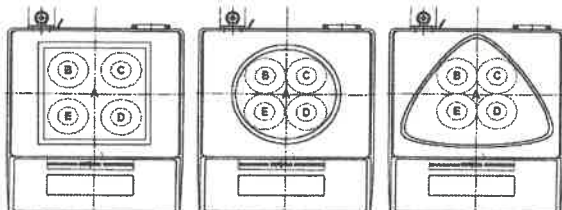
Nominal test value (g)	Standard Deviation
20	0.00005
200	0.00008

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.5	0.50001	0.5000	0.0000	0.00013	2.09
1	1.00002	1.0000	0.0000	0.00013	2.09
2	2.00001	2.0000	0.0000	0.00013	2.09
5	5.00002	4.9999	-0.0001	0.00013	2.08
10	10.00001	9.9999	-0.0001	0.00013	2.08
20	20.00002	19.9998	-0.0002	0.00013	2.07
50	50.00001	49.9995	-0.0005	0.00015	2.05
100	100.00006	99.9993	-0.0008	0.00019	2.02
120	120.00008	119.9992	-0.0009	0.00022	2.01
150	150.00007	149.9988	-0.0013	0.00025	2.01
200	199.99991	199.9982	-0.0017	0.00030	2.00

After Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

			Nominal Test Value		100	(g)
Reference Points (g)						
A		B		C		D
-		0.0001		0.0000		-0.0001
						0.0001

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
20	0.00005
200	0.00007

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

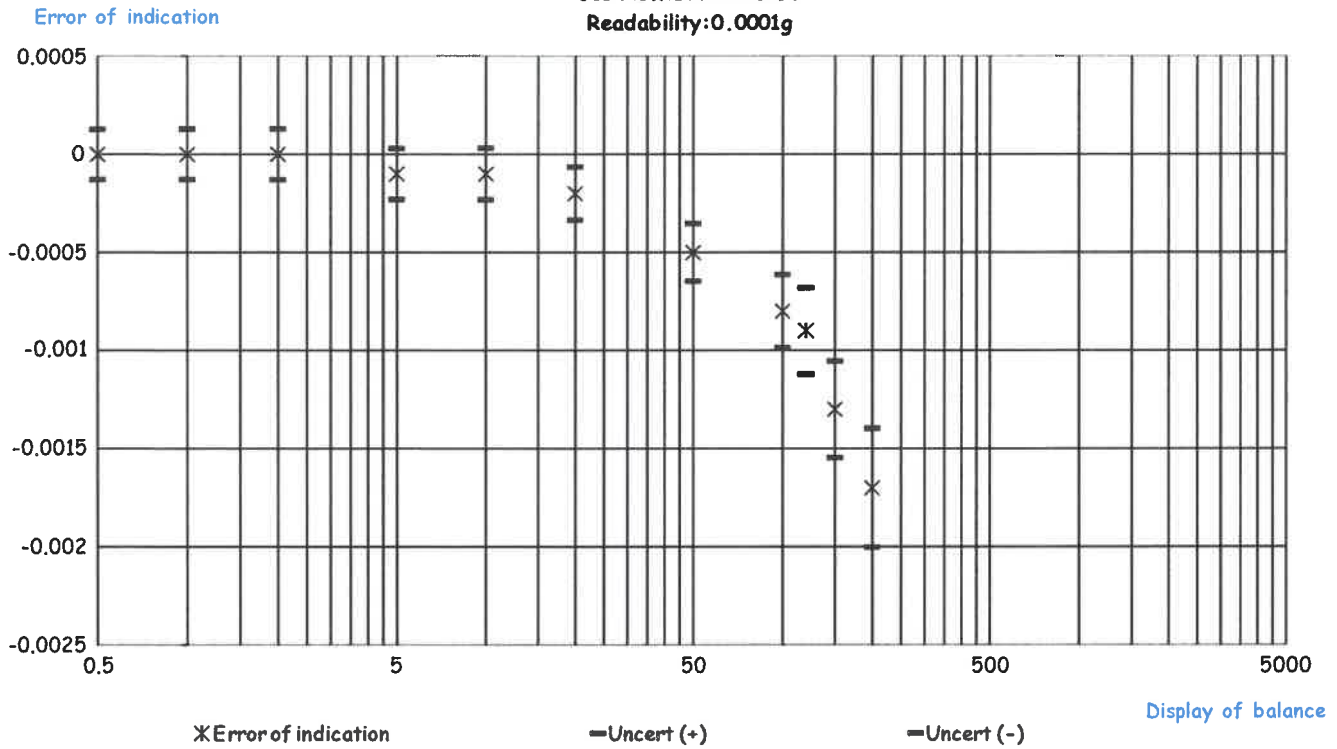
Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.5	0.50001	0.5000	0.0000	0.00012	2.07
1	1.00002	1.0000	0.0000	0.00012	2.07
2	2.00001	2.0000	0.0000	0.00012	2.07
5	5.00002	5.0000	0.0000	0.00012	2.06
10	10.00001	10.0000	0.0000	0.00012	2.06
20	20.00002	20.0000	0.0000	0.00013	2.05
50	50.00001	50.0000	0.0000	0.00014	2.03
100	100.00006	100.0001	0.0000	0.00018	2.01
120	120.00008	120.0002	0.0001	0.00021	2.01
150	150.00007	150.0002	0.0001	0.00024	2.00
200	199.99991	200.0000	0.0001	0.00030	2.00

The End of Certificate

Before Adjustment

Job No. KSPR2215298

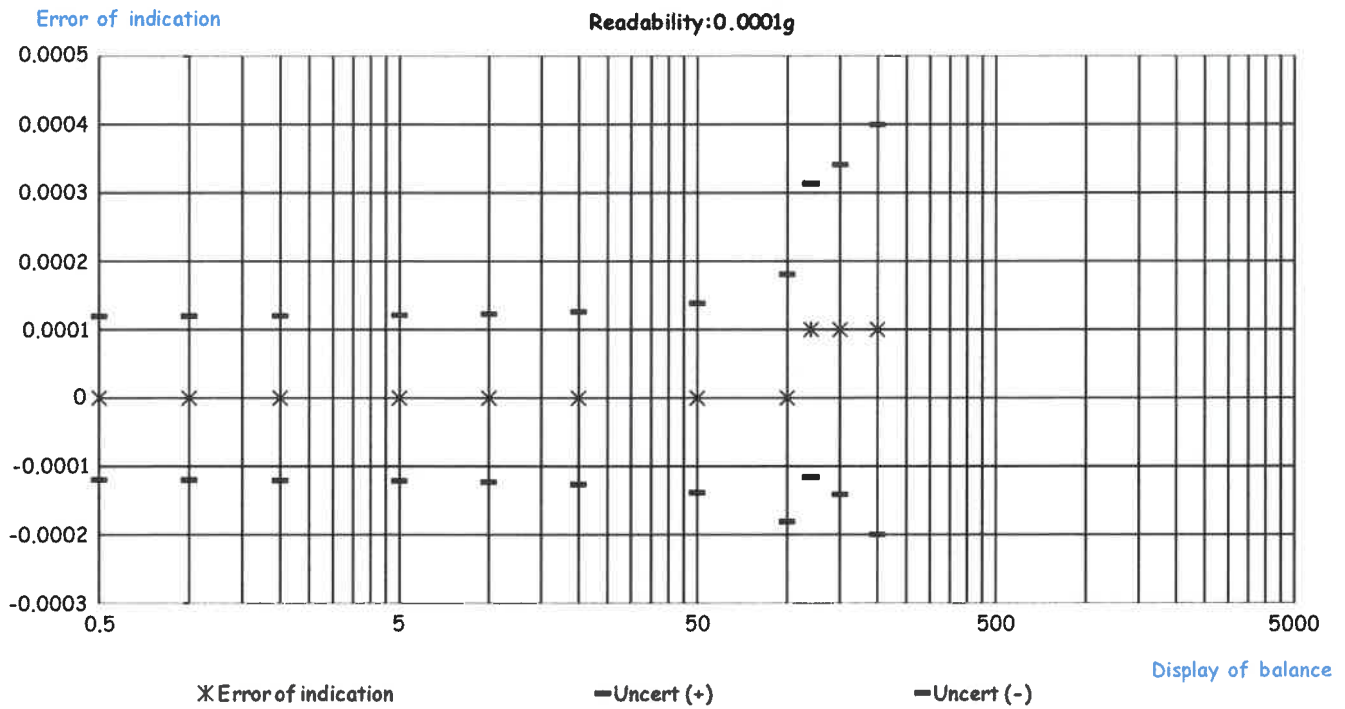
Readability: 0.0001g



After Adjust

Job No. KSPR2215298

Readability: 0.0001g



ใบตรวจสอบสภาพเครื่องชั่ง

เลขที่ใบงาน: KSPR2215298

ชนิดเครื่องมือ: Balance

รุ่น: PA214

หมายเลขเครื่อง: B416510537

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
09 Dec 2022			09 Dec 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดกระจกกันลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. ความสมบูรณ์ชุดของระดับน้ำ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของขาตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การตอบสนองของปุ่มกด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การแสดงผลของ Display หลังวางน้ำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองจานชั่ง (Stopper) / pan support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของตัวเครื่องภายนอกและแกน load cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติม/ข้อแนะนำ :

Mr. Atachai Ngamchanat

Service Engineer



Certificate of Calibration

Equipment:	Hot Air Oven	Certificate No.:	C31221187
Model:	UF 55	Issued Date:	18 June 2022
Serial No.(or ID):	B215.0024(HO-02)	Job No.:	KSPR2207300
Manufacturer:	Memmert	Page:	1 of 4
Condition:	In Condition	Ventilation Valve:	Closed
Shelves(pc.):	1		

Customer: ECO CONSULTANT COMPANY LIMITED.
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Environment Condition:

Temperature:	25 °C	±	0.9 °C
Humidity:	59 %RH	±	3.7 %RH
Voltage:	223 VAC	±	3.6 VAC


Calibration Place: ECO CONSULTANT COMPANY LIMITED. (ห้องปฏิบัติการวิเคราะห์ ชั้น 2)
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Calibration By: Mr. Ampol Srisumphan

Calibration Date: 17 June 2022


The Method used: In house method, SPCC-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C10220004


(Mr. Ampol Srisumphan)

Person in charge


บริษัท เอสพีซี อาร์ที จำกัด
SPC RT Co., Ltd.

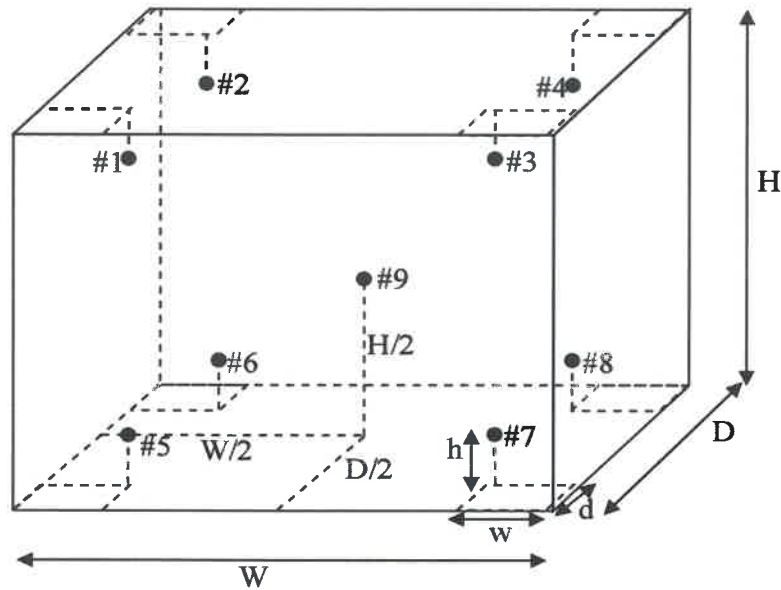

(Mr. Udon Srichana)

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 SPC RT Co., Ltd.



Standard Installation Locations

Volume (Calibration Zone)= 21 (Liters)

Inside chamber: W = 40 (cm) D = 33 (cm) H = 40 (cm)

Standard Locations (#1, #2, #3, #4): w = 5 (cm) d = 5 (cm) h = 5 (cm)

Standard Locations (#5, #6, #7, #8): w = 5 (cm) d = 5 (cm) h = 5 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	1	2	3	4	5	6	7	8	9

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

Certificate No.: C31221187

Page: 3 of 4

Calibration Results:

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	104.13	0.13	0.52
#2	104.12	0.12	0.52
#3	104.45	0.45	0.51
#4	104.22	0.22	0.49
#5	103.87	-0.13	0.56
#6	103.61	-0.39	0.53
#7	103.78	-0.22	0.59
#8	103.73	-0.27	0.51
#9	104.27	0.27	0.51

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.0	104.0	104.13	104.12	104.45	104.22	103.87	103.61	103.78	103.73	104.27	0.59

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.72	0.41	1.51

Note: * Maximum uncertainty of the each position

Certificate No.: C31221187

Page: 4 of 4

Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	180.33	0.33	0.52
#2	179.99	-0.01	0.52
#3	180.88	0.88	0.52
#4	180.17	0.17	0.52
#5	179.92	-0.08	0.52
#6	179.29	-0.71	0.52
#7	178.75	-1.25	0.55
#8	179.40	-0.60	0.52
#9	180.35	0.35	0.52

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
180.0	180.0	180.0	180.33	179.99	180.88	180.17	179.92	179.29	178.75	179.40	180.35	0.55

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	1.79	0.17	2.37

Note: * Maximum uncertainty of the each position

The End of Certificate

Certificate No.: C31221187 Page: 1 of 2

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :**
- ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA
 - ☒ Choice B Non-binary statement with guard band ($w = 1 U$), Specific Risk < 2.5% PFA
 - ☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r U$) .
- ; PFA – Probability of False Accept



(Mr. Udon Srichana)
Authorized signatory

Without adjustment

Desired Temperature : 104.0°C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured (°C)	Correction of UUC. (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	104.13	0.13	0.52	1.0	Pass
#2	104.12	0.12	0.52	1.0	Pass
#3	104.45	0.45	0.51	1.0	Pass
#4	104.22	0.22	0.49	1.0	Pass
#5	103.87	-0.13	0.56	1.0	Pass
#6	103.61	-0.39	0.53	1.0	Pass
#7	103.78	-0.22	0.59	1.0	Pass
#8	103.73	-0.27	0.51	1.0	Pass
#9	104.27	0.27	0.51	1.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

Certificate No.: C31221187 Page: 2 of 2

Statements of conformity:(Cont.)**Without adjustment (Cont.)**

Desired Temperature : 180.0°C Tolerances : 2.0 °C

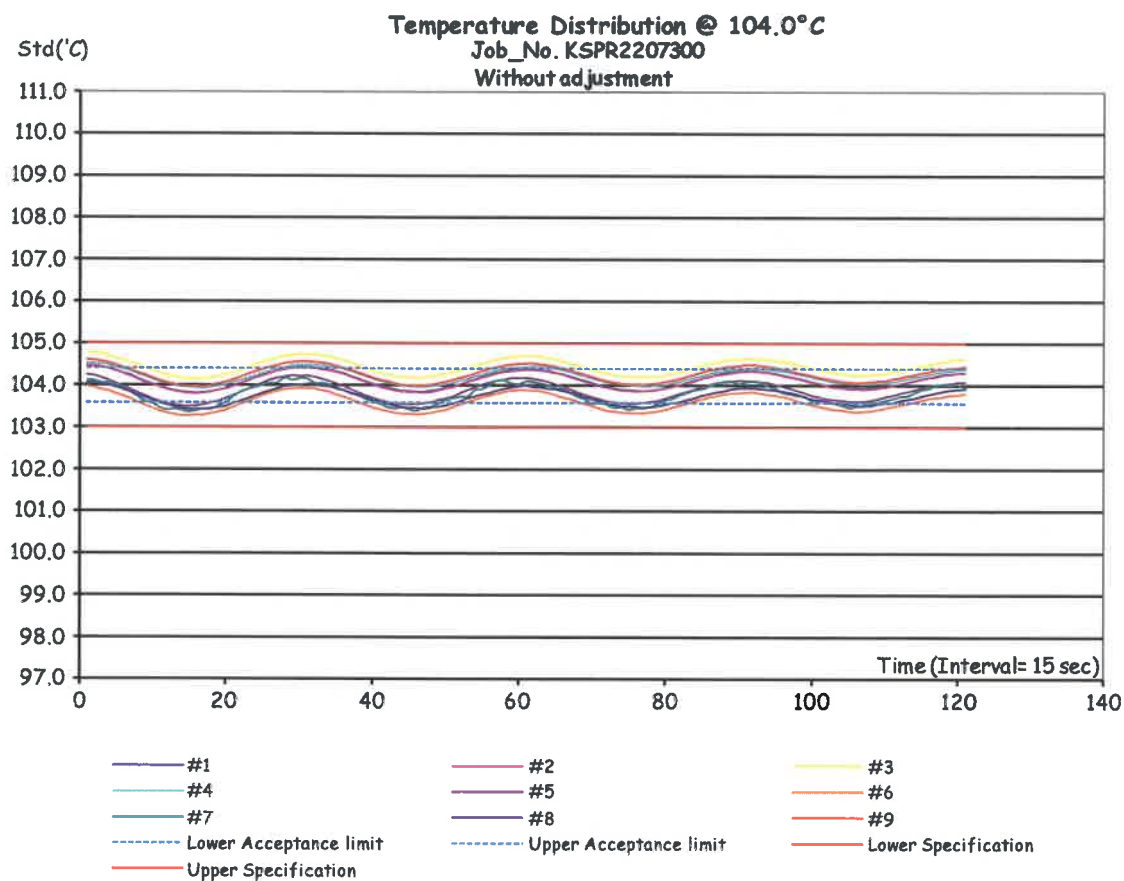
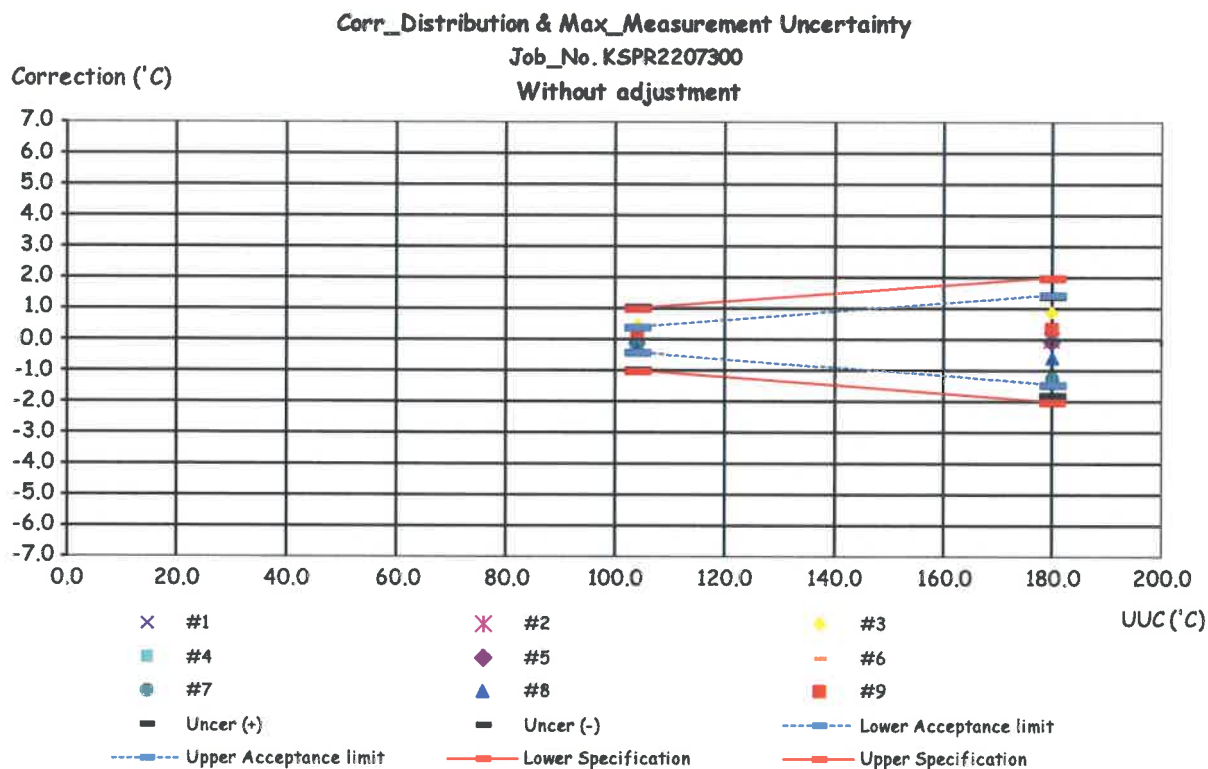
Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured (°C)	Correction of UUC.* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	180.33	0.33	0.52	2.0	Pass
#2	179.99	-0.01	0.52	2.0	Pass
#3	180.88	0.88	0.52	2.0	Pass
#4	180.17	0.17	0.52	2.0	Pass
#5	179.92	-0.08	0.52	2.0	Pass
#6	179.29	-0.71	0.52	2.0	Pass
#7	178.75	-1.25	0.55	2.0	Pass
#8	179.40	-0.60	0.52	2.0	Pass
#9	180.35	0.35	0.52	2.0	Pass

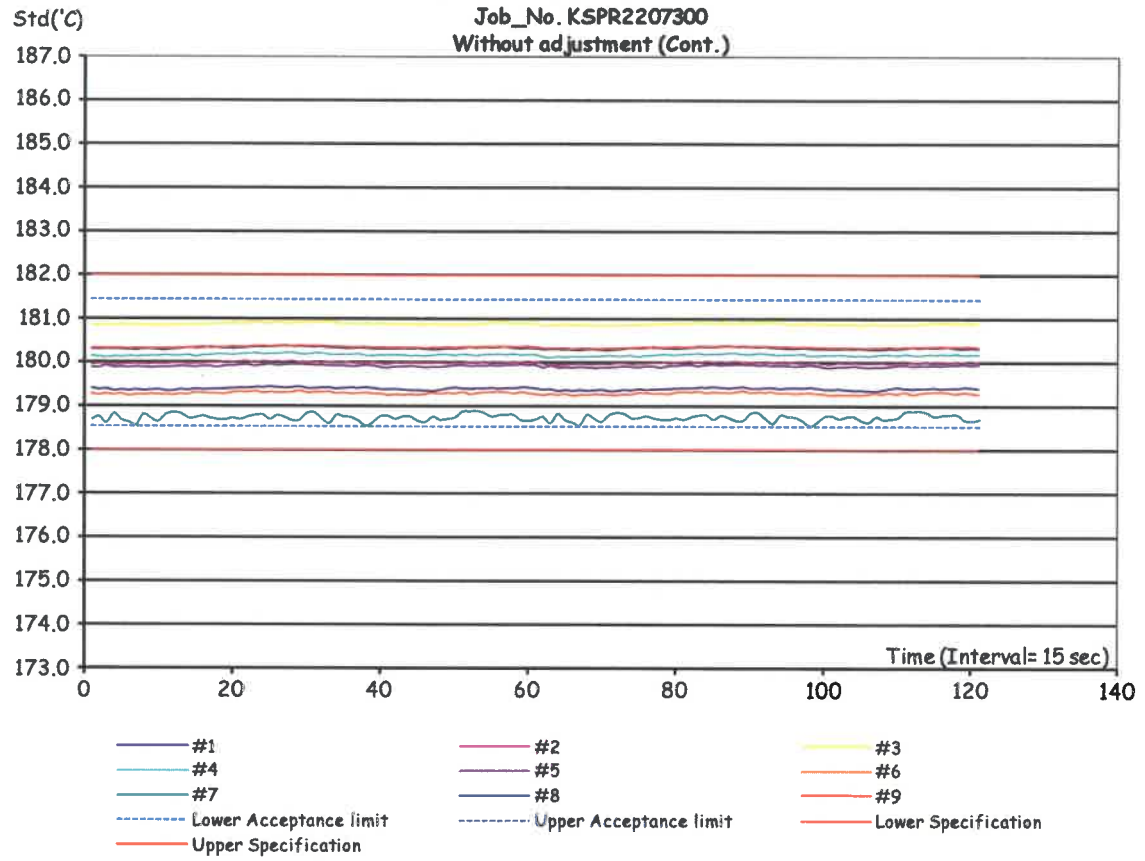
Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity



Temperature Distribution @ 180.0°C
Job_No. KSPR2207300
Without adjustment (Cont.)



ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2207300

ชนิดเครื่องมือ: Hot Air Oven

รุ่น: UF 55

หมายเลขเครื่อง: B215.0024(HO-02)

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
17 Jun 2022			17 Jun 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Ampol Srisumphan

Service Engineer



CERTIFICATE OF CALIBRATION

Customer: ECO CONSULTANT COMPANY LIMITED
32/3-4, Moo.4, Toi koh, Sam kok,
Pathumthani 12160

Manufacturer: Hanon

Model Number: SH420F

Description: Graphite Digester

Asset Number: SH526220249

Serial #: SH526220249

P.O. #: N/A

Procedure: CPTD-05 (Sep, 2020)

Certificate Number: TTH-58350

Temperature: 25 °C

Relative Humidity: 56 %RH

Calibration Location: On-Site

Calibrated By: GAKKAPONG KONGKAMUD

Calibration Date: 22/Sep/2022

Next Due Date: 22/Sep/2023

Condition Received: IN TOLERANCE

Condition Returned: IN TOLERANCE

This certifies that the above instrument was calibrated in compliance with the Calibration System Requirements of ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 (R2002) in accordance with referenced procedures. Standards used to perform this calibration are traceable to SI units; their source of traceability derives from a National Metrology Institute such as NIST, CENAM, NPL, DIN, from natural physical constants, consensus standards or derived by the ratio type of calibrations. Collective uncertainties are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2). Unless otherwise noted calibrations are performed to manufacturer's specifications. Compliance statements are in conformance with ILAC-G8:2019 simple acceptance decision rule. This form shall not be reproduced, except in full, without the expressed written consent of Techmaster. Contact our customer service representative for clarification of this document.

Standards Utilized

Standard #	Description	Manufacturer	Model #	Due Date	Test Report #
5680	Digital Multimeter	Hewlett Packard	3458A	09/Mar/2023	TTH-0-54073-R6
5755	Standard PRTs	FLUKE	5626	29/Jul/2023	TTH-0-57476

Remarks:

W. Chootian

Wannipa Chootian
Quality Assurance

P. Moonmuangsan

Pornthep Moonmuangsan
Technical Manager

N. Homta

Nopparat Homta
Approved By

Issued on: 2022-09-28 20:16:31.9500000 -07:00

TTH-58350



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Page 1 of 2

Calibration Results



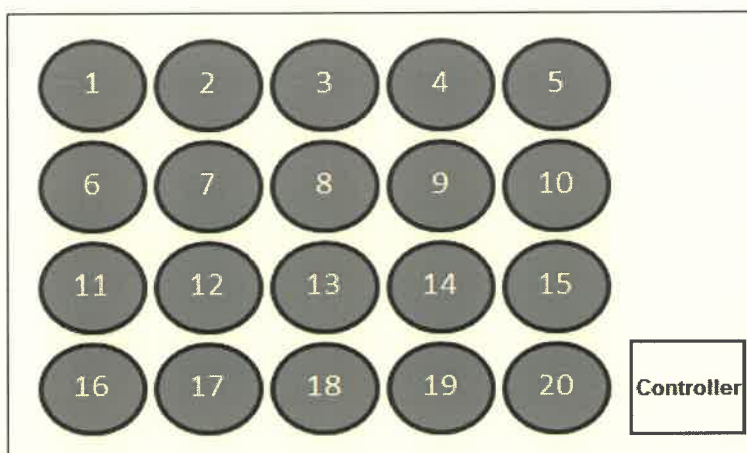
Manufacturer: Hanon
Description: Graphite Digester

Asset No. SH526220249
Serial No. SH526220249

Model # : SH420F

Report No. TTH-58350

Furnace Hole



Temperature Accuracy

Furnace Hole	UUT Displayed	Measured Value				Uncertainty	Tolerance	
		Resistance	Actual Value	Error	Result		Min	Max
1	380.0 °C	241.4682 Ω	379.54 °C	0.46 °C	Pass	0.30 °C	379.00 °C	381.00 °C
2	380.0 °C	241.4839 Ω	379.59 °C	0.41 °C	Pass	0.30 °C	379.00 °C	381.00 °C
3	380.0 °C	241.4280 Ω	379.43 °C	0.57 °C	Pass	0.30 °C	379.00 °C	381.00 °C
4	380.0 °C	241.4145 Ω	379.39 °C	0.61 °C	Pass	0.30 °C	379.00 °C	381.00 °C
5	380.0 °C	241.4737 Ω	379.56 °C	0.44 °C	Pass	0.30 °C	379.00 °C	381.00 °C
6	380.0 °C	241.4305 Ω	379.44 °C	0.56 °C	Pass	0.30 °C	379.00 °C	381.00 °C
7	380.0 °C	241.4365 Ω	379.45 °C	0.55 °C	Pass	0.30 °C	379.00 °C	381.00 °C
8	380.0 °C	241.4084 Ω	379.37 °C	0.63 °C	Pass	0.30 °C	379.00 °C	381.00 °C
9	380.0 °C	241.4041 Ω	379.36 °C	0.64 °C	Pass	0.30 °C	379.00 °C	381.00 °C
10	380.0 °C	241.4663 Ω	379.54 °C	0.46 °C	Pass	0.30 °C	379.00 °C	381.00 °C
11	380.0 °C	241.4313 Ω	379.44 °C	0.56 °C	Pass	0.30 °C	379.00 °C	381.00 °C
12	380.0 °C	241.5030 Ω	379.64 °C	0.36 °C	Pass	0.30 °C	379.00 °C	381.00 °C
13	380.0 °C	241.4577 Ω	379.51 °C	0.49 °C	Pass	0.30 °C	379.00 °C	381.00 °C
14	380.0 °C	241.6011 Ω	379.92 °C	0.08 °C	Pass	0.30 °C	379.00 °C	381.00 °C
15	380.0 °C	241.4752 Ω	379.56 °C	0.44 °C	Pass	0.30 °C	379.00 °C	381.00 °C
16	380.0 °C	241.5588 Ω	379.80 °C	0.20 °C	Pass	0.30 °C	379.00 °C	381.00 °C
17	380.0 °C	241.3959 Ω	379.34 °C	0.66 °C	Pass	0.30 °C	379.00 °C	381.00 °C
18	380.0 °C	241.4577 Ω	379.51 °C	0.49 °C	Pass	0.30 °C	379.00 °C	381.00 °C
19	380.0 °C	241.4482 Ω	379.49 °C	0.51 °C	Pass	0.30 °C	379.00 °C	381.00 °C
20	380.0 °C	241.4709 Ω	379.55 °C	0.45 °C	Pass	0.30 °C	379.00 °C	381.00 °C

Notes : - The calibration results are verified its tolerance with the manufacturer's specification.

- The instrument was calibrated for the parameter and at the points specified by the customer.

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TTH-58350

Page 2 of 2

ประจำเดือนมีนาคม พ.ศ. 2566



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CH1650

Page.: 1 of 3

Certificate of Calibration

Equipment :	pH Meter
Manufacturer :	Mettler Toledo
Model :	Five Easy
Serial No. :	B617389478
ID No. :	PH-02
Condition As-Received:	Used Item
Received Date :	29 November 2022
Calibration Date :	30 November 2022
Reference :	2211-1001WN-1
Submitted by :	Hi-Tech Utilities Corp.,Ltd. 61 Moo 1 Tambol Banlen, A.Bangpa-In, Ayutthaya 13160
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure :	In - house method : - CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM) - CP-CH8 by comparison with standard thermometer

Calibrated by : Walalak Sirithean

Approved by :


Approved Signatory

- (☒) Malee Butkruea
(☐) Saithip Meangmai
(☐) Warakorn Lerngagtrakul

Issue Date : 1 December 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0048267



Cert.No.: 22CH1650

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023
2) Ref. Standard Thermometer	4982054	110RC044	22I1306	27 Oct 2023

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

- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	823320	20 June 2024
pH 6.987	CPA chem	823322	20 June 2023
pH 10.008	CPA chem	826590	09 July 2023

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: B617389478	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.01	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00

Malu



Cert.No.: 22CH1650

Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode S/N.: 2255776	4.008	4.02	173	0.0086	2.05
	6.987	6.99	2	0.011	2.00
	10.008	10.01	-172	0.0096	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : LE438
- Serial No. : 2255776

Dimension of probe;

- Length : 12 mm.
- Diameter : 120 mm.
- Immersion Depth : 100 mm.

Calibration Point ($^{\circ}\text{C}$)	Standard Temperature ($^{\circ}\text{C}$)	UUC* Reading ($^{\circ}\text{C}$)	Error ($^{\circ}\text{C}$)	Uncertainty of measurement (\pm $^{\circ}\text{C}$)	Coverage factor k
25.0	25.000	25.1	0.100	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

-o0o-

Malu.



Certificate of Calibration

Equipment:	Cooled Incubator	Certificate No.:	C31221188
Model:	i250	Issued Date:	20 June 2022
Serial No.(or ID):	0408-0215-0017 (CI-01)	Job No.:	KSPR2207301
Manufacturer:	Accuplus	Page:	1 of 4
Condition:	In Condition	Ventilation Valve:	None
Shelves(pc.):	4		

Customer: ECO CONSULTANT COMPANY LIMITED.
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Environment Condition:

Temperature:	26 °C	±	0.9 °C
Humidity:	60 %RH	±	4.2 %RH
Voltage:	223 VAC	±	3.4 VAC

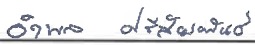
Calibration Place: ECO CONSULTANT COMPANY LIMITED. (ห้องปฏิบัติการวิเคราะห์ ชั้น 2)
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Calibration By: Mr. Ampol Srisumphan

Calibration Date: 17 June 2022


The Method used: In house method, SPCC-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C10220004


(Mr. Ampol Srisumphan)

Person in charge


บริษัท เอสพีซี อาร์ที จำกัด
SPC RT Co., Ltd

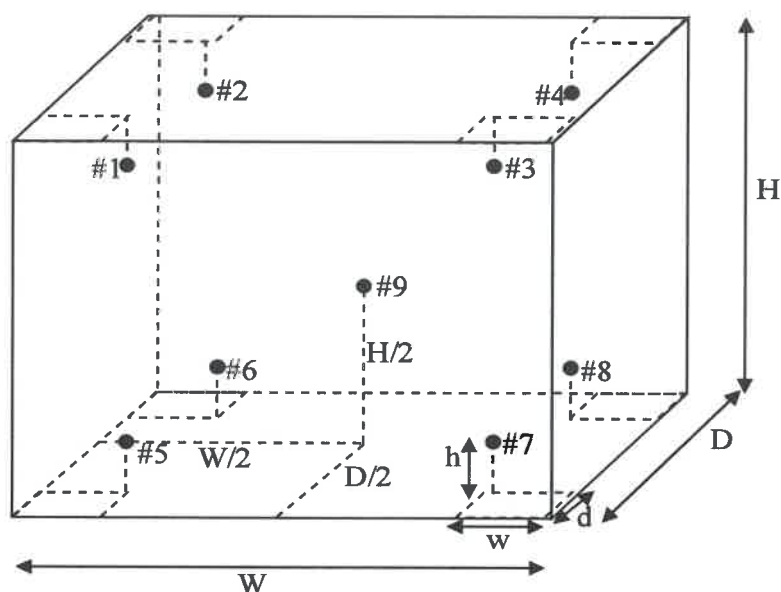

(Mr. Udon Srichana)

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 SPC RT Co., Ltd.



Standard Installation Locations

Volume (Calibration Zone)= 102 (Liters)

Inside chamber:	W = 50 (cm)	D = 44 (cm)	H = 119 (cm)
Standard Locations (#1, #2, #3, #4):	w = 5 (cm)	d = 5 (cm)	h = 32 (cm)
Standard Locations (#5, #6, #7, #8):	w = 5 (cm)	d = 5 (cm)	h = 12 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	1	2	3	4	5	6	7	8	9

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

Certificate No.: C31221188

Page: 3 of 4

Calibration Results:**Without adjustment**

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 2.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	4.26	2.26	0.51
#2	3.51	1.51	0.52
#3	2.60	0.60	0.52
#4	2.73	0.73	0.51
#5	3.29	1.29	0.51
#6	2.80	0.80	0.51
#7	2.41	0.41	0.51
#8	2.64	0.64	0.51
#9	2.32	0.32	0.51

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
3.0	2.0	2.0	4.26	3.51	2.60	2.73	3.29	2.80	2.41	2.64	2.32	0.52

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
2.0	2.01	0.13	2.09

Note: * Maximum uncertainty of the each position

Certificate No.: C31221188

Page: 4 of 4

Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	20.68	0.68	0.34
#2	20.37	0.37	0.33
#3	19.98	-0.02	0.45
#4	20.15	0.15	0.35
#5	20.16	0.16	0.36
#6	20.14	0.14	0.36
#7	19.84	-0.16	0.35
#8	19.84	-0.16	0.38
#9	19.80	-0.20	0.39

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
20.0	20.0	20.0	20.68	20.37	19.98	20.15	20.16	20.14	19.84	19.84	19.80	0.45

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
20.0	0.95	0.30	1.27

Note: * Maximum uncertainty of the each position

The End of Certificate

Certificate No.: C31221188 Page: 1 of 2

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :** ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA
- ☒ Choice B Non-binary statement with guard band ($w = 1 U$), Specific Risk < 2.5% PFA
- ☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r U$) .
- ; PFA – Probability of False Accept




(Mr. Udon Srichana)

Authorized signatory

Without adjustment

Desired Temperature : 3.0°C Tolerances : 3.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 2.0 °C

Locations	Measured (°C)	Correction of UUC. (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	4.26	1.26	0.51	3.0	Pass
#2	3.51	0.51	0.52	3.0	Pass
#3	2.60	-0.40	0.52	3.0	Pass
#4	2.73	-0.27	0.51	3.0	Pass
#5	3.29	0.29	0.51	3.0	Pass
#6	2.80	-0.20	0.51	3.0	Pass
#7	2.41	-0.59	0.51	3.0	Pass
#8	2.64	-0.36	0.51	3.0	Pass
#9	2.32	-0.68	0.51	3.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

Certificate No.: C31221188 Page: 2 of 2

Statements of conformity:(Cont.)**Without adjustment (Cont.)**

Desired Temperature : 20.0°C Tolerances : 3.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured (°C)	Correction of UUC.* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	20.68	0.68	0.34	3.0	Pass
#2	20.37	0.37	0.33	3.0	Pass
#3	19.98	-0.02	0.45	3.0	Pass
#4	20.15	0.15	0.35	3.0	Pass
#5	20.16	0.16	0.36	3.0	Pass
#6	20.14	0.14	0.36	3.0	Pass
#7	19.84	-0.16	0.35	3.0	Pass
#8	19.84	-0.16	0.38	3.0	Pass
#9	19.80	-0.20	0.39	3.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

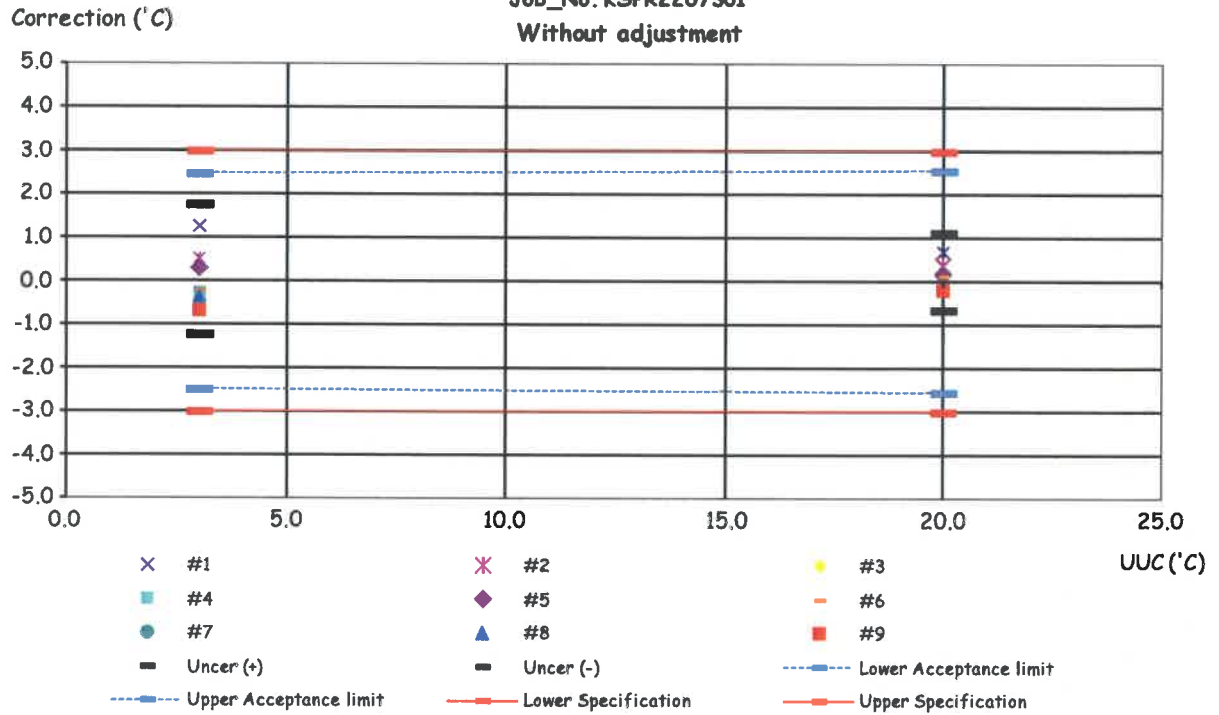
The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity

Corr_Distribution & Max_Measurement Uncertainty

Job_No. KSPR2207301

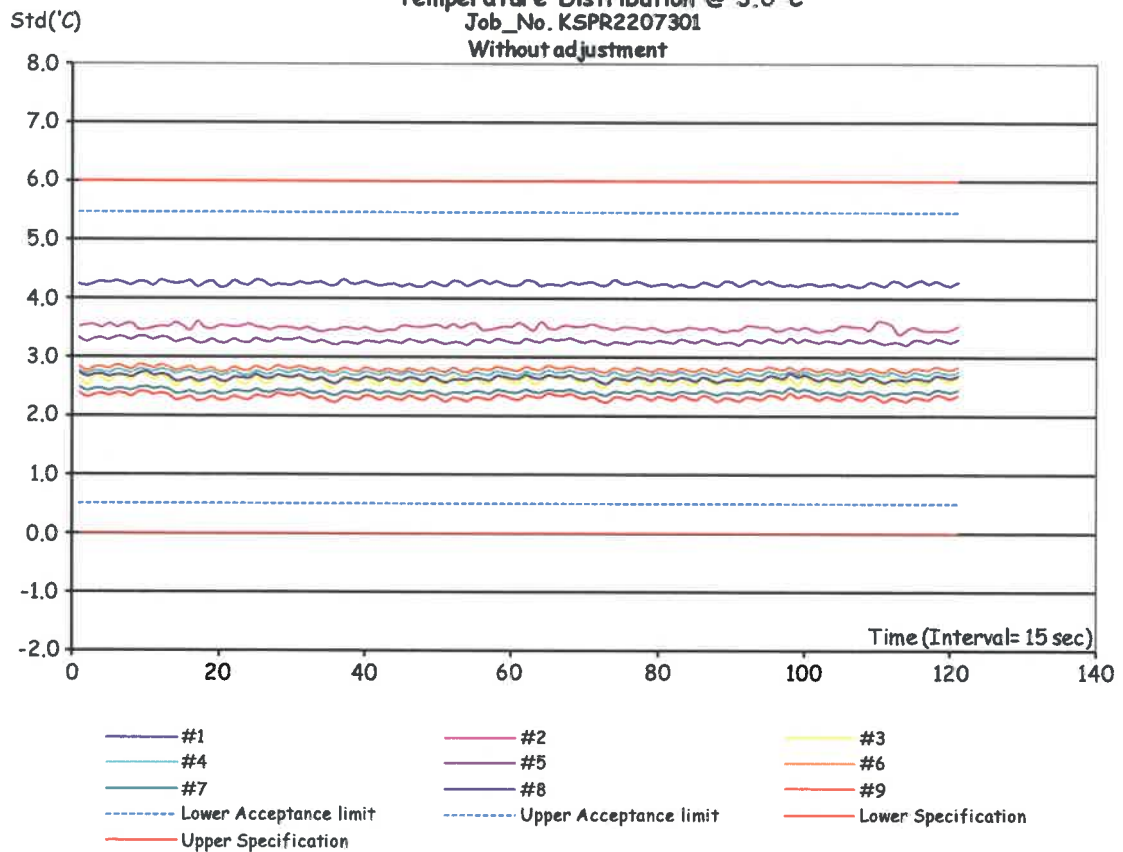
Without adjustment



Temperature Distribution @ 3.0°C

Job_No. KSPR2207301

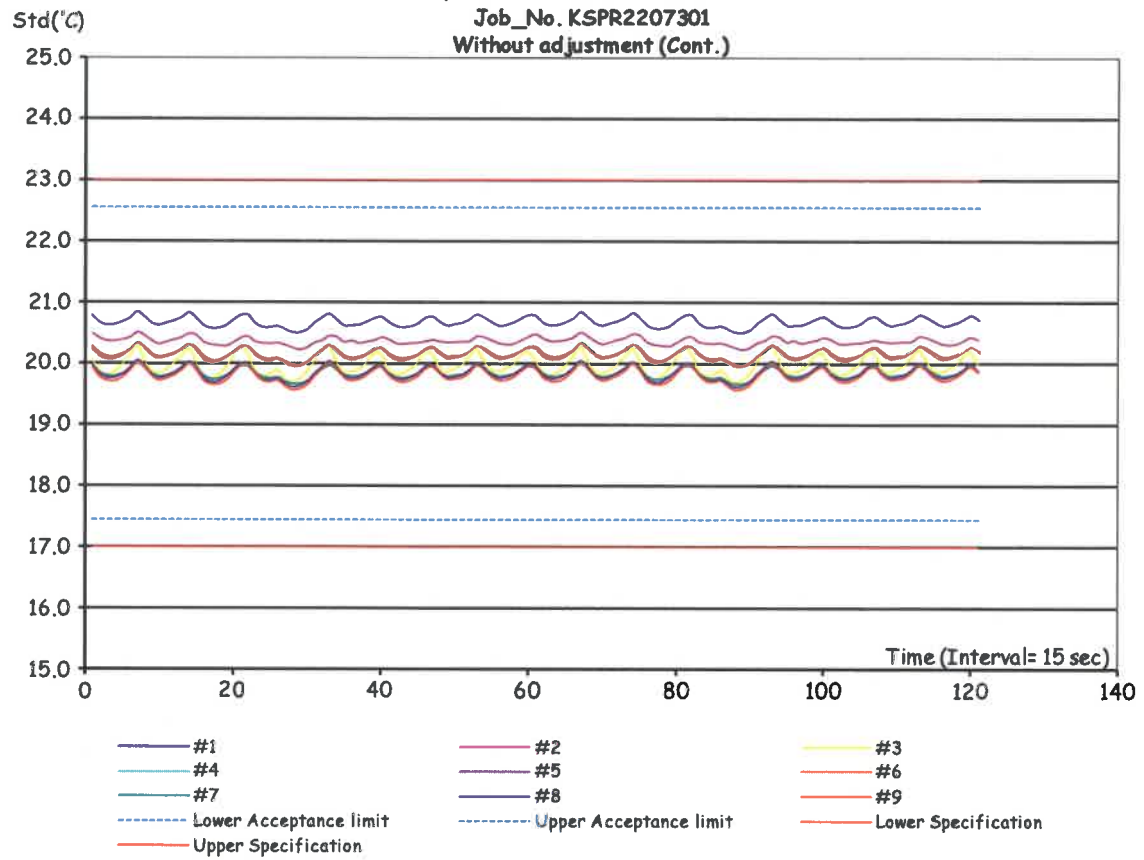
Without adjustment



Temperature Distribution @ 20.0°C

Job_No. KSPR2207301

Without adjustment (Cont.)



ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2207301

ชนิดเครื่องมือ: Cooled Incubator

รุ่น: i250

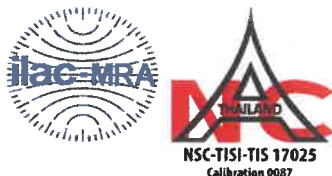
หมายเลขเครื่อง: 0408-0215-0017 (CI-01)

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
17 Jun 2022			17 Jun 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Ampol Srisumphan

Service Engineer



Certificate of Calibration

Equipment:	Balance	Certificate No.:	C01223748
Model:	PA214	Issued Date:	10 December 2022
Serial No. (or ID.):	B416510537 (BA-02)	Job No.:	KSPR2215298
Manufacturer:	Ohaus	Page:	1 of 3
Condition:	In condition		

Customer: ECO CONSULTANT COMPANY LIMITED.
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Environment Condition: Temperature 23 °C ± 0.6 °C
Humidity 62 %RH ± 3.4 %RH

Calibration Place: ECO CONSULTANT COMPANY LIMITED. (ห้องเครื่องชั่ง)
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Calibration By: Mr. Atachai Ngamchanat

Calibration Date: 09 December 2022

The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02221865



(Mr. Atachai Ngamchanat)

Person in charge



(Mr. Rungrod Jenkitrakulchai)

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.

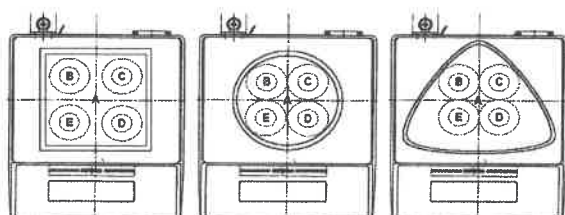
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

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.

Calibration Results:

Before Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

			Nominal Test Value	100	(g)
Reference Points (g)					
A	B	C	D	E	
-	0.0000	-0.0001	0.0001	0.0001	

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

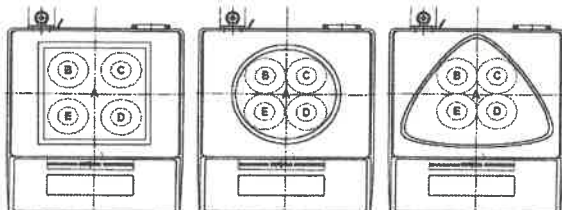
Nominal test value (g)	Standard Deviation
20	0.00005
200	0.00008

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.5	0.50001	0.5000	0.0000	0.00013	2.09
1	1.00002	1.0000	0.0000	0.00013	2.09
2	2.00001	2.0000	0.0000	0.00013	2.09
5	5.00002	4.9999	-0.0001	0.00013	2.08
10	10.00001	9.9999	-0.0001	0.00013	2.08
20	20.00002	19.9998	-0.0002	0.00013	2.07
50	50.00001	49.9995	-0.0005	0.00015	2.05
100	100.00006	99.9993	-0.0008	0.00019	2.02
120	120.00008	119.9992	-0.0009	0.00022	2.01
150	150.00007	149.9988	-0.0013	0.00025	2.01
200	199.99991	199.9982	-0.0017	0.00030	2.00

After Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

			Nominal Test Value		100	(g)
Reference Points (g)						
A	B	C	D	E		
-	0.0001	0.0000	-0.0001	0.0001		

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
20	0.00005
200	0.00007

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

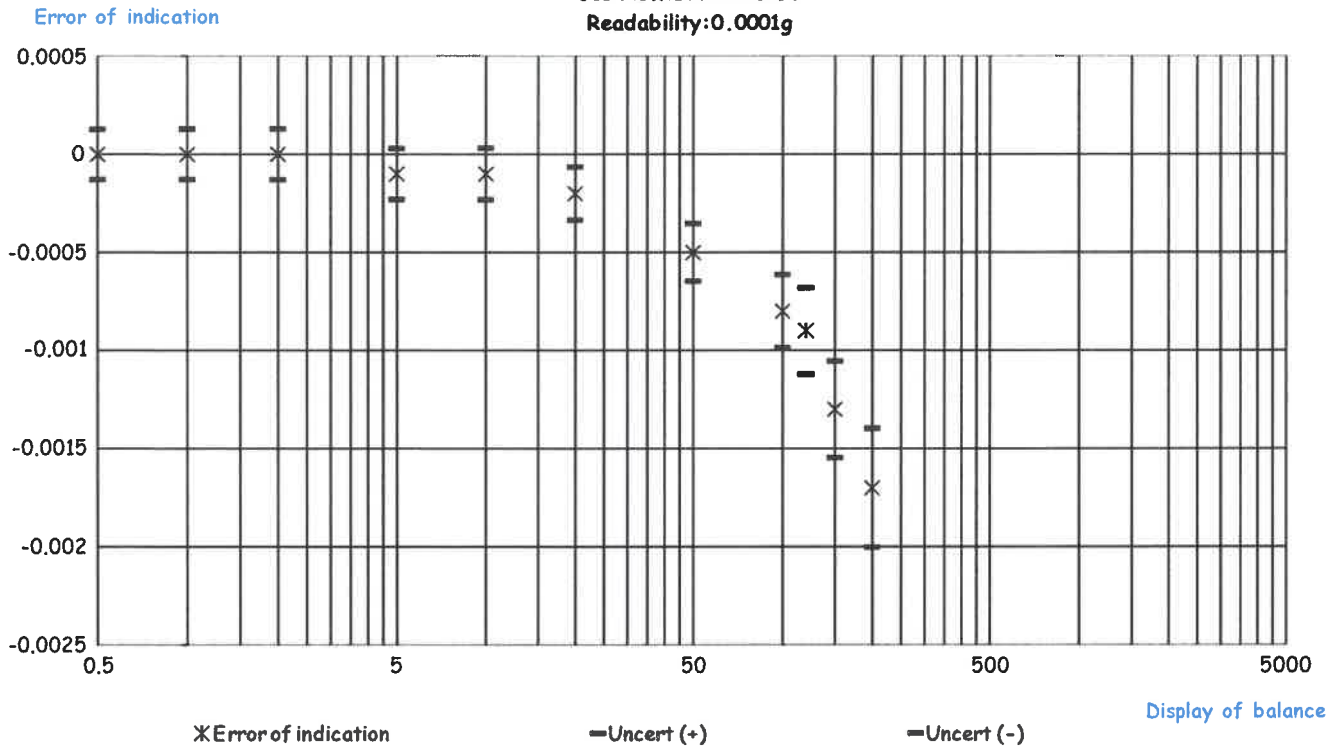
Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.5	0.50001	0.5000	0.0000	0.00012	2.07
1	1.00002	1.0000	0.0000	0.00012	2.07
2	2.00001	2.0000	0.0000	0.00012	2.07
5	5.00002	5.0000	0.0000	0.00012	2.06
10	10.00001	10.0000	0.0000	0.00012	2.06
20	20.00002	20.0000	0.0000	0.00013	2.05
50	50.00001	50.0000	0.0000	0.00014	2.03
100	100.00006	100.0001	0.0000	0.00018	2.01
120	120.00008	120.0002	0.0001	0.00021	2.01
150	150.00007	150.0002	0.0001	0.00024	2.00
200	199.99991	200.0000	0.0001	0.00030	2.00

The End of Certificate

Before Adjustment

Job No. KSPR2215298

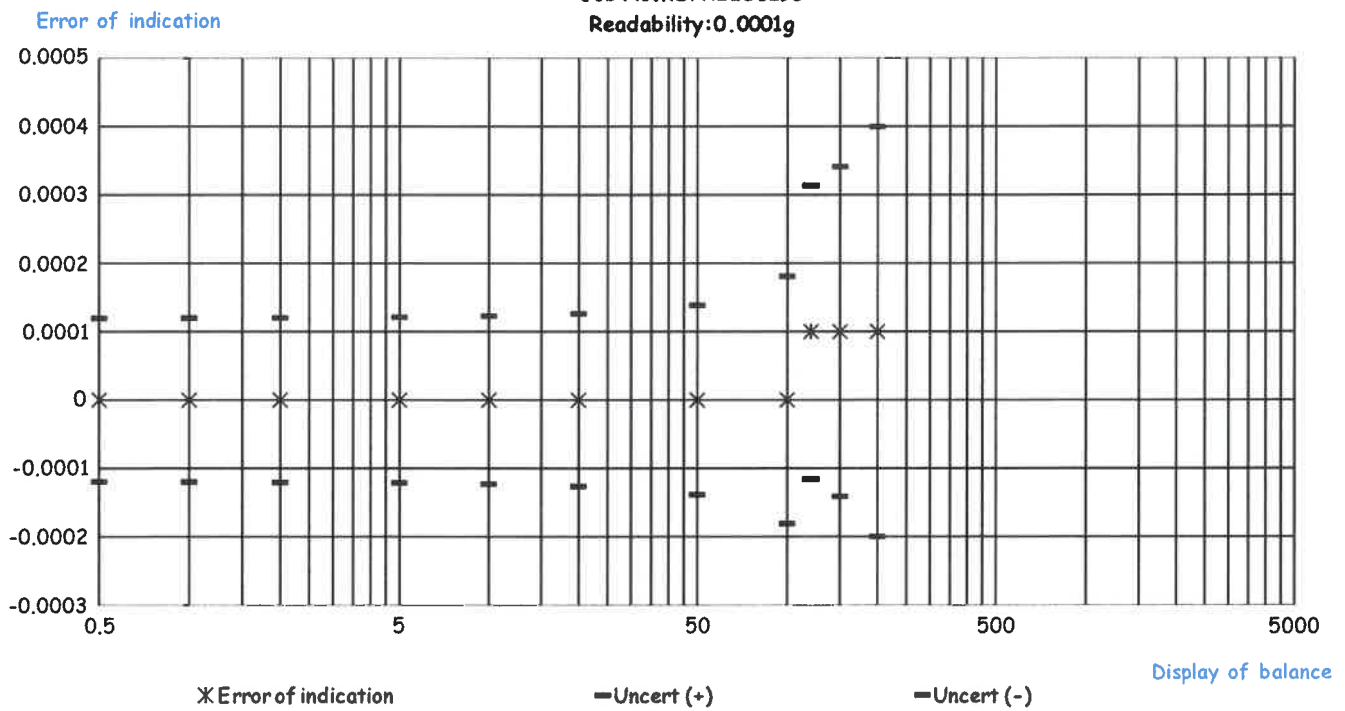
Readability: 0.0001g



After Adjust

Job No. KSPR2215298

Readability: 0.0001g



ใบตรวจสอบสภาพเครื่องชั่ง

เลขที่ใบงาน: KSPR2215298

ชนิดเครื่องมือ: Balance

รุ่น: PA214

หมายเลขเครื่อง: B416510537

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
09 Dec 2022			09 Dec 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดกระจกกันลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. ความสมบูรณ์ชุดของระดับน้ำ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของขาตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การตอบสนองของปุ่มกด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การแสดงผลของ Display หลังวางน้ำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองจานชั่ง (Stopper) / pan support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของตัวเครื่องภายนอกและแกน load cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติม/ข้อแนะนำ :

Mr. Atachai Ngamchanat

Service Engineer



Certificate of Calibration

Equipment:	Hot Air Oven	Certificate No.:	C31221187
Model:	UF 55	Issued Date:	18 June 2022
Serial No.(or ID):	B215.0024(HO-02)	Job No.:	KSPR2207300
Manufacturer:	Memmert	Page:	1 of 4
Condition:	In Condition	Ventilation Valve:	Closed
Shelves(pc.):	1		

Customer: ECO CONSULTANT COMPANY LIMITED.
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Environment Condition:

Temperature:	25 °C	±	0.9 °C
Humidity:	59 %RH	±	3.7 %RH
Voltage:	223 VAC	±	3.6 VAC


Calibration Place: ECO CONSULTANT COMPANY LIMITED. (ห้องปฏิบัติการวิเคราะห์ ชั้น 2)
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Calibration By: Mr. Ampol Srisumphan

Calibration Date: 17 June 2022


The Method used: In house method, SPCC-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C10220004


(Mr. Ampol Srisumphan)

Person in charge


บริษัท เอสพีซี อาร์ที จำกัด
SPC RT Co., Ltd.

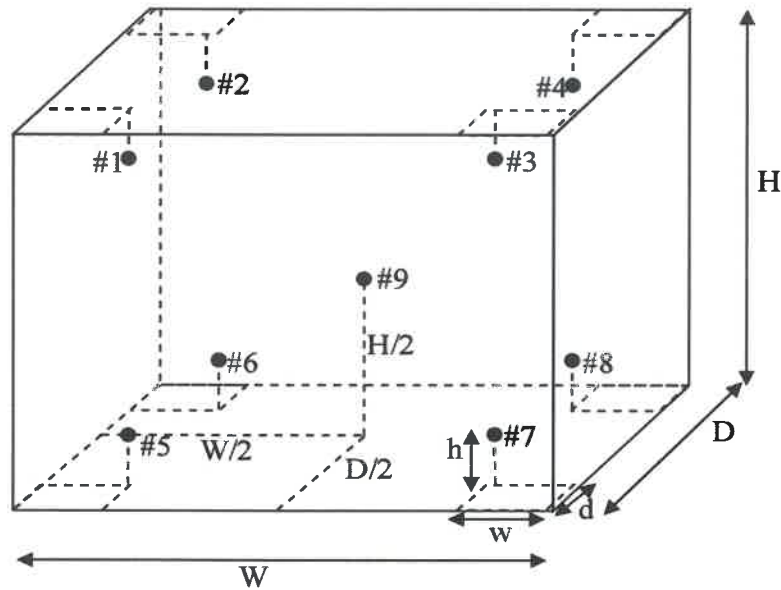

(Mr. Udon Srichana)

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 SPC RT Co., Ltd.



Standard Installation Locations

Volume (Calibration Zone)= 21 (Liters)

Inside chamber: W = 40 (cm) D = 33 (cm) H = 40 (cm)

Standard Locations (#1, #2, #3, #4): w = 5 (cm) d = 5 (cm) h = 5 (cm)

Standard Locations (#5, #6, #7, #8): w = 5 (cm) d = 5 (cm) h = 5 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	1	2	3	4	5	6	7	8	9

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

Certificate No.: C31221187

Page: 3 of 4

Calibration Results:

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	104.13	0.13	0.52
#2	104.12	0.12	0.52
#3	104.45	0.45	0.51
#4	104.22	0.22	0.49
#5	103.87	-0.13	0.56
#6	103.61	-0.39	0.53
#7	103.78	-0.22	0.59
#8	103.73	-0.27	0.51
#9	104.27	0.27	0.51

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.0	104.0	104.13	104.12	104.45	104.22	103.87	103.61	103.78	103.73	104.27	0.59

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.72	0.41	1.51

Note: * Maximum uncertainty of the each position

Certificate No.: C31221187

Page: 4 of 4

Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	180.33	0.33	0.52
#2	179.99	-0.01	0.52
#3	180.88	0.88	0.52
#4	180.17	0.17	0.52
#5	179.92	-0.08	0.52
#6	179.29	-0.71	0.52
#7	178.75	-1.25	0.55
#8	179.40	-0.60	0.52
#9	180.35	0.35	0.52

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
180.0	180.0	180.0	180.33	179.99	180.88	180.17	179.92	179.29	178.75	179.40	180.35	0.55

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	1.79	0.17	2.37

Note: * Maximum uncertainty of the each position

The End of Certificate

Certificate No.: C31221187 Page: 1 of 2

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :**
- ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA
 - ☒ Choice B Non-binary statement with guard band ($w = 1 U$), Specific Risk < 2.5% PFA
 - ☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r U$) .
- ; PFA – Probability of False Accept



(Mr. Udon Srichana)
Authorized signatory

Without adjustment

Desired Temperature : 104.0°C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured (°C)	Correction of UUC. (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	104.13	0.13	0.52	1.0	Pass
#2	104.12	0.12	0.52	1.0	Pass
#3	104.45	0.45	0.51	1.0	Pass
#4	104.22	0.22	0.49	1.0	Pass
#5	103.87	-0.13	0.56	1.0	Pass
#6	103.61	-0.39	0.53	1.0	Pass
#7	103.78	-0.22	0.59	1.0	Pass
#8	103.73	-0.27	0.51	1.0	Pass
#9	104.27	0.27	0.51	1.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

Certificate No.: C31221187 Page: 2 of 2

Statements of conformity:(Cont.)**Without adjustment (Cont.)**

Desired Temperature : 180.0°C Tolerances : 2.0 °C

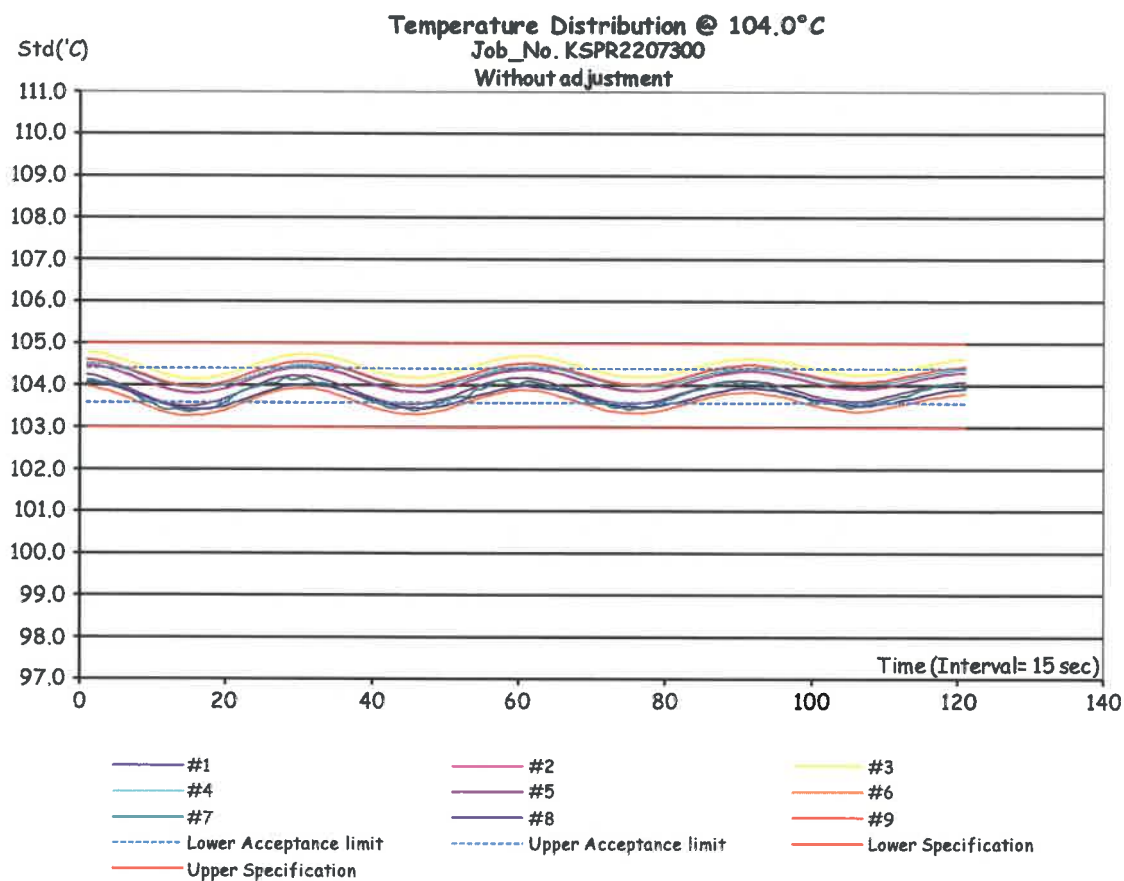
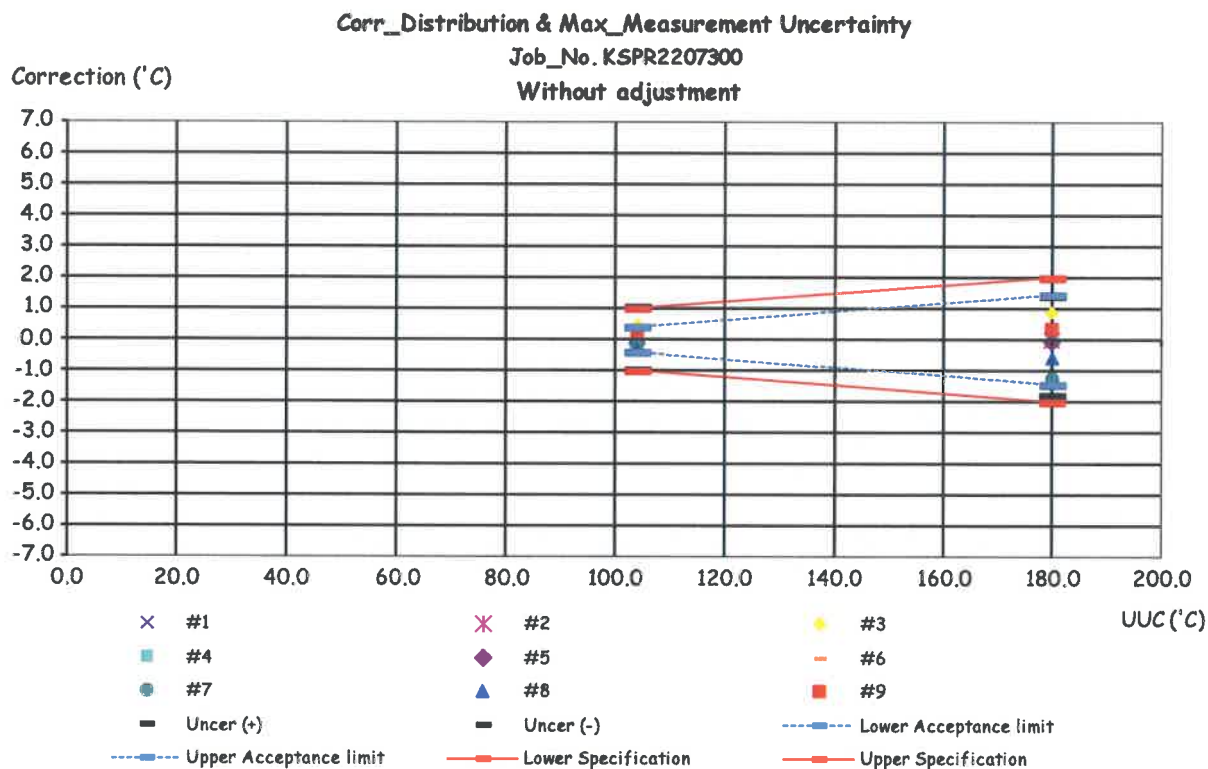
Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured (°C)	Correction of UUC.* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	180.33	0.33	0.52	2.0	Pass
#2	179.99	-0.01	0.52	2.0	Pass
#3	180.88	0.88	0.52	2.0	Pass
#4	180.17	0.17	0.52	2.0	Pass
#5	179.92	-0.08	0.52	2.0	Pass
#6	179.29	-0.71	0.52	2.0	Pass
#7	178.75	-1.25	0.55	2.0	Pass
#8	179.40	-0.60	0.52	2.0	Pass
#9	180.35	0.35	0.52	2.0	Pass

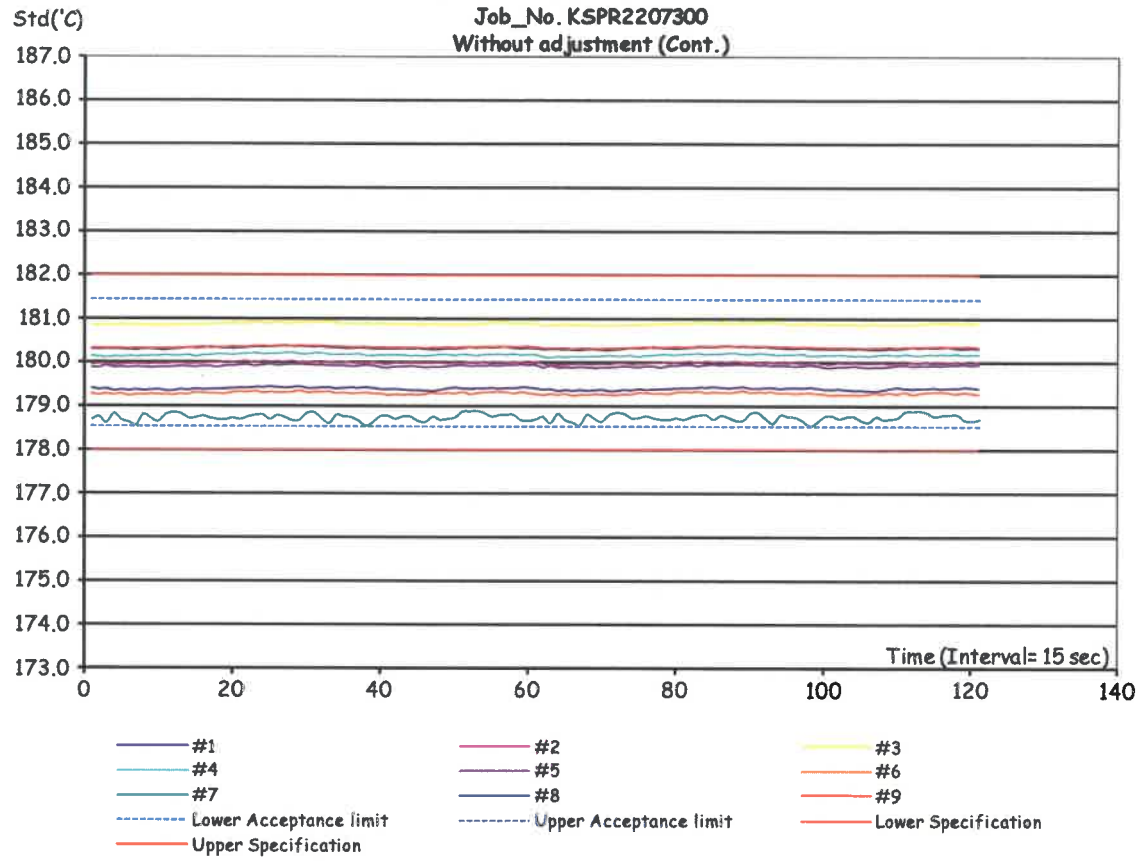
Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity



Temperature Distribution @ 180.0°C
Job_No. KSPR2207300
Without adjustment (Cont.)



ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2207300

ชนิดเครื่องมือ: Hot Air Oven

รุ่น: UF 55

หมายเลขเครื่อง: B215.0024(HO-02)

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
17 Jun 2022			17 Jun 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Ampol Srisumphan

Service Engineer

CERTIFICATE OF CALIBRATION

Customer: ECO CONSULTANT COMPANY LIMITED
 32/3-4, Moo.4, Toi koh, Sam kok,
 Pathumthani 12160

Manufacturer: Hanon

Model Number: SH420F

Description: Graphite Digester

Asset Number: SH526220249

Serial #: SH526220249

P.O. #: N/A

Procedure: CPTD-05 (Sep, 2020)

Certificate Number: TTH-58350

Temperature: 25 °C

Relative Humidity: 56 %RH

Calibration Location: On-Site

Calibrated By: GAKKAPONG KONGKAMUD

Calibration Date: 22/Sep/2022

Next Due Date: 22/Sep/2023

Condition Received: IN TOLERANCE

Condition Returned: IN TOLERANCE

This certifies that the above instrument was calibrated in compliance with the Calibration System Requirements of ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 (R2002) in accordance with referenced procedures. Standards used to perform this calibration are traceable to SI units; their source of traceability derives from a National Metrology Institute such as NIST, CENAM, NPL, DIN, from natural physical constants, consensus standards or derived by the ratio type of calibrations. Collective uncertainties are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2). Unless otherwise noted calibrations are performed to manufacturer's specifications. Compliance statements are in conformance with ILAC-G8:2019 simple acceptance decision rule. This form shall not be reproduced, except in full, without the expressed written consent of Techmaster. Contact our customer service representative for clarification of this document.

Standards Utilized

Standard #	Description	Manufacturer	Model #	Due Date	Test Report #
5680	Digital Multimeter	Hewlett Packard	3458A	09/Mar/2023	TTH-0-54073-R6
5755	Standard PRTs	FLUKE	5626	29/Jul/2023	TTH-0-57476

Remarks:

W. Chootian

Wannipa Chootian
 Quality Assurance

P. Moonmuangsan

Pornthep Moonmuangsan
 Technical Manager

N. Homta

Nopparat Homta
 Approved By

Issued on: 2022-09-28 20:16:31.9500000 -07:00

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TTH-58350



Page 1 of 2

Calibration Results



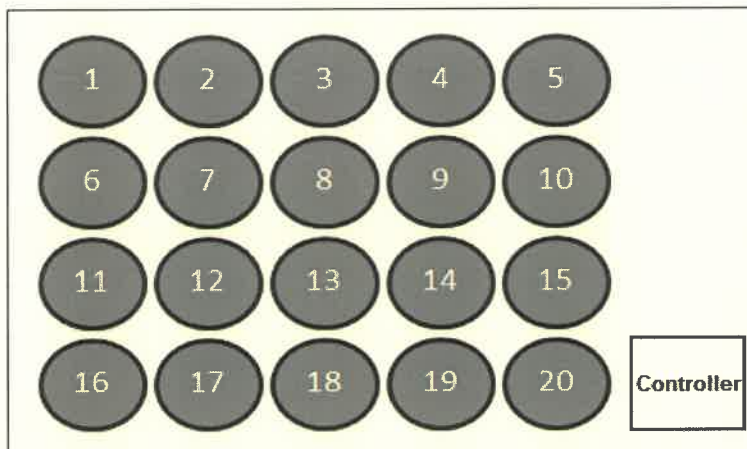
Manufacturer: Hanon
Description: Graphite Digester

Asset No. SH526220249
Serial No. SH526220249

Model # : SH420F

Report No. TTH-58350

Furnace Hole



Temperature Accuracy

Furnace Hole	UUT Displayed	Measured Value				Uncertainty	Tolerance	
		Resistance	Actual Value	Error	Result		Min	Max
1	380.0 °C	241.4682 Ω	379.54 °C	0.46 °C	Pass	0.30 °C	379.00 °C	381.00 °C
2	380.0 °C	241.4839 Ω	379.59 °C	0.41 °C	Pass	0.30 °C	379.00 °C	381.00 °C
3	380.0 °C	241.4280 Ω	379.43 °C	0.57 °C	Pass	0.30 °C	379.00 °C	381.00 °C
4	380.0 °C	241.4145 Ω	379.39 °C	0.61 °C	Pass	0.30 °C	379.00 °C	381.00 °C
5	380.0 °C	241.4737 Ω	379.56 °C	0.44 °C	Pass	0.30 °C	379.00 °C	381.00 °C
6	380.0 °C	241.4305 Ω	379.44 °C	0.56 °C	Pass	0.30 °C	379.00 °C	381.00 °C
7	380.0 °C	241.4365 Ω	379.45 °C	0.55 °C	Pass	0.30 °C	379.00 °C	381.00 °C
8	380.0 °C	241.4084 Ω	379.37 °C	0.63 °C	Pass	0.30 °C	379.00 °C	381.00 °C
9	380.0 °C	241.4041 Ω	379.36 °C	0.64 °C	Pass	0.30 °C	379.00 °C	381.00 °C
10	380.0 °C	241.4663 Ω	379.54 °C	0.46 °C	Pass	0.30 °C	379.00 °C	381.00 °C
11	380.0 °C	241.4313 Ω	379.44 °C	0.56 °C	Pass	0.30 °C	379.00 °C	381.00 °C
12	380.0 °C	241.5030 Ω	379.64 °C	0.36 °C	Pass	0.30 °C	379.00 °C	381.00 °C
13	380.0 °C	241.4577 Ω	379.51 °C	0.49 °C	Pass	0.30 °C	379.00 °C	381.00 °C
14	380.0 °C	241.6011 Ω	379.92 °C	0.08 °C	Pass	0.30 °C	379.00 °C	381.00 °C
15	380.0 °C	241.4752 Ω	379.56 °C	0.44 °C	Pass	0.30 °C	379.00 °C	381.00 °C
16	380.0 °C	241.5588 Ω	379.80 °C	0.20 °C	Pass	0.30 °C	379.00 °C	381.00 °C
17	380.0 °C	241.3959 Ω	379.34 °C	0.66 °C	Pass	0.30 °C	379.00 °C	381.00 °C
18	380.0 °C	241.4577 Ω	379.51 °C	0.49 °C	Pass	0.30 °C	379.00 °C	381.00 °C
19	380.0 °C	241.4482 Ω	379.49 °C	0.51 °C	Pass	0.30 °C	379.00 °C	381.00 °C
20	380.0 °C	241.4709 Ω	379.55 °C	0.45 °C	Pass	0.30 °C	379.00 °C	381.00 °C

Notes : - The calibration results are verified its tolerance with the manufacturer's specification.

- The instrument was calibrated for the parameter and at the points specified by the customer.

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TTH-58350



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ประจำเดือนเมษายน พ.ศ. 2566



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CH1650

Page.: 1 of 3

Certificate of Calibration

Equipment :	pH Meter
Manufacturer :	Mettler Toledo
Model :	Five Easy
Serial No. :	B617389478
ID No. :	PH-02
Condition As-Received:	Used Item
Received Date :	29 November 2022
Calibration Date :	30 November 2022
Reference :	2211-1001WN-1
Submitted by :	Hi-Tech Utilities Corp.,Ltd. 61 Moo 1 Tambol Banlen, A.Bangpa-In, Ayutthaya 13160
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure :	In - house method : - CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM) - CP-CH8 by comparison with standard thermometer

Calibrated by : Walalak Sirithean

Approved by :


Approved Signatory

- (☒) Malee Butkruea
() Saithip Meangmai
() Warakorn Lerngagtrakul

Issue Date : 1 December 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0048267



Cert.No.: 22CH1650

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023
2) Ref. Standard Thermometer	4982054	110RC044	22I1306	27 Oct 2023

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

- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	823320	20 June 2024
pH 6.987	CPA chem	823322	20 June 2023
pH 10.008	CPA chem	826590	09 July 2023

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: B617389478	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.01	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00

Malu



Cert.No.: 22CH1650

Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode S/N.: 2255776	4.008	4.02	173	0.0086	2.05
	6.987	6.99	2	0.011	2.00
	10.008	10.01	-172	0.0096	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : LE438
- Serial No. : 2255776

Dimension of probe;

- Length : 12 mm.
- Diameter : 120 mm.
- Immersion Depth : 100 mm.

Calibration Point ($^{\circ}\text{C}$)	Standard Temperature ($^{\circ}\text{C}$)	UUC* Reading ($^{\circ}\text{C}$)	Error ($^{\circ}\text{C}$)	Uncertainty of measurement (\pm $^{\circ}\text{C}$)	Coverage factor k
25.0	25.000	25.1	0.100	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

-o0o-

Malu.



Certificate of Calibration

Equipment: Balance
Model: PA214
Serial No. (or ID.): B416510537 (BA-02)
Manufacturer: Ohaus
Condition: In condition

Certificate No.: C01223748
Issued Date: 10 December 2022
Job No.: KSPR2215298
Page: 1 of 3

Customer: ECO CONSULTANT COMPANY LIMITED.
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Environment Condition: Temperature 23 °C ± 0.6 °C
Humidity 62 %RH ± 3.4 %RH

Calibration Place: ECO CONSULTANT COMPANY LIMITED. (ห้องเครื่องชั่ง)
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Calibration By: Mr. Atachai Ngamchanat

Calibration Date: 09 December 2022

The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02221865



(Mr. Atachai Ngamchanat)

Person in charge



(Mr. Rungrod Jenkitrakulchai)

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.

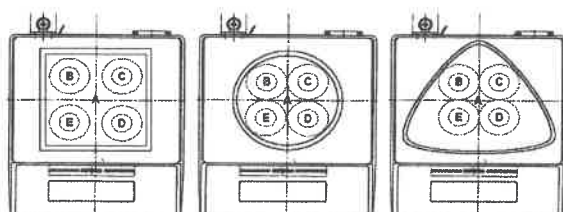
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

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.

Calibration Results:

Before Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

			Nominal Test Value		100	(g)	
Reference Points (g)							
A		B		C		D	E
-		0.0000		-0.0001		0.0001	0.0001

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

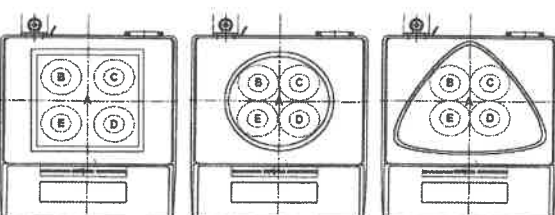
Nominal test value (g)	Standard Deviation
20	0.00005
200	0.00008

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.5	0.50001	0.5000	0.0000	0.00013	2.09
1	1.00002	1.0000	0.0000	0.00013	2.09
2	2.00001	2.0000	0.0000	0.00013	2.09
5	5.00002	4.9999	-0.0001	0.00013	2.08
10	10.00001	9.9999	-0.0001	0.00013	2.08
20	20.00002	19.9998	-0.0002	0.00013	2.07
50	50.00001	49.9995	-0.0005	0.00015	2.05
100	100.00006	99.9993	-0.0008	0.00019	2.02
120	120.00008	119.9992	-0.0009	0.00022	2.01
150	150.00007	149.9988	-0.0013	0.00025	2.01
200	199.99991	199.9982	-0.0017	0.00030	2.00

After Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

			Nominal Test Value		100	(g)
Reference Points (g)						
A		B		C		D
-		0.0001		0.0000		-0.0001
						0.0001

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
20	0.00005
200	0.00007

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

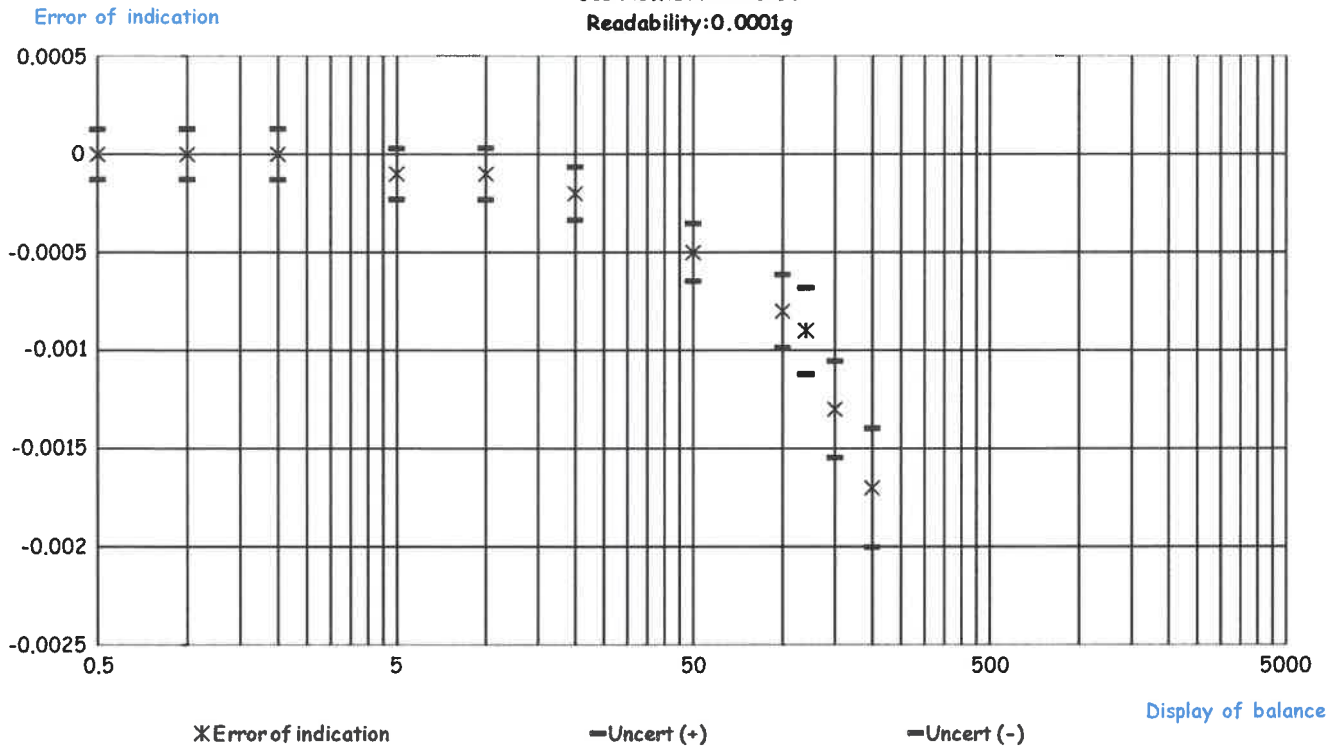
Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.5	0.50001	0.5000	0.0000	0.00012	2.07
1	1.00002	1.0000	0.0000	0.00012	2.07
2	2.00001	2.0000	0.0000	0.00012	2.07
5	5.00002	5.0000	0.0000	0.00012	2.06
10	10.00001	10.0000	0.0000	0.00012	2.06
20	20.00002	20.0000	0.0000	0.00013	2.05
50	50.00001	50.0000	0.0000	0.00014	2.03
100	100.00006	100.0001	0.0000	0.00018	2.01
120	120.00008	120.0002	0.0001	0.00021	2.01
150	150.00007	150.0002	0.0001	0.00024	2.00
200	199.99991	200.0000	0.0001	0.00030	2.00

The End of Certificate

Before Adjustment

Job No. KSPR2215298

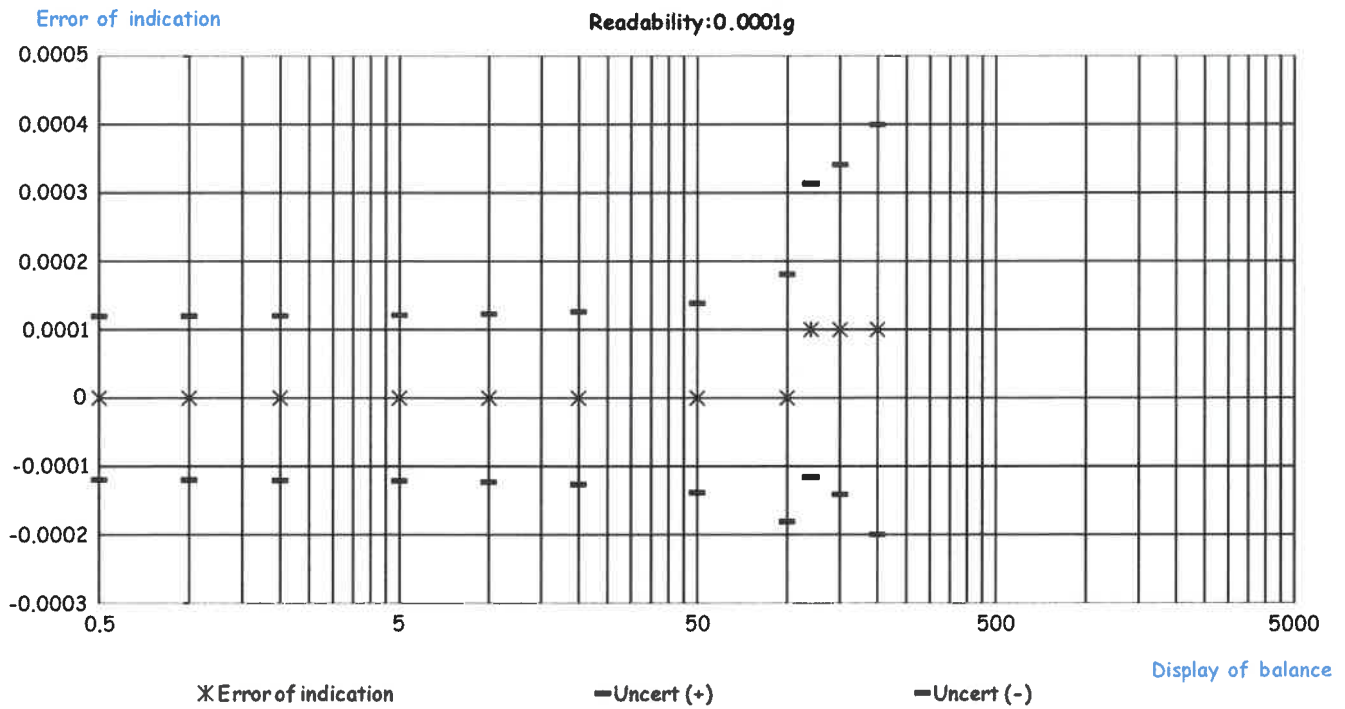
Readability: 0.0001g



After Adjust

Job No. KSPR2215298

Readability: 0.0001g



ใบตรวจสอบสภาพเครื่องชั่ง

เลขที่ใบงาน: KSPR2215298

ชนิดเครื่องมือ: Balance

รุ่น: PA214

หมายเลขเครื่อง: B416510537

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
09 Dec 2022			09 Dec 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดกระจกกันลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. ความสมบูรณ์ชุดของระดับน้ำ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของขาตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การตอบสนองของปุ่มกด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การแสดงผลของ Display หลังวางน้ำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองจานชั่ง (Stopper) / pan support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของตัวเครื่องภายนอกและแกน load cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติม/ข้อแนะนำ :

Mr. Atachai Ngamchanat

Service Engineer



Certificate of Calibration

Equipment:	Hot Air Oven	Certificate No.:	C31221187
Model:	UF 55	Issued Date:	18 June 2022
Serial No.(or ID):	B215.0024(HO-02)	Job No.:	KSPR2207300
Manufacturer:	Memmert	Page:	1 of 4
Condition:	In Condition	Ventilation Valve:	Closed
Shelves(pc.):	1		

Customer: ECO CONSULTANT COMPANY LIMITED.
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Environment Condition:

Temperature:	25 °C	±	0.9 °C
Humidity:	59 %RH	±	3.7 %RH
Voltage:	223 VAC	±	3.6 VAC


Calibration Place: ECO CONSULTANT COMPANY LIMITED. (ห้องปฏิบัติการวิเคราะห์ ชั้น 2)
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Calibration By: Mr. Ampol Srisumphan

Calibration Date: 17 June 2022


The Method used: In house method, SPCC-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C10220004


(Mr. Ampol Srisumphan)

Person in charge


บริษัท เอสพีซี อาร์ที จำกัด
SPC RT Co., Ltd.

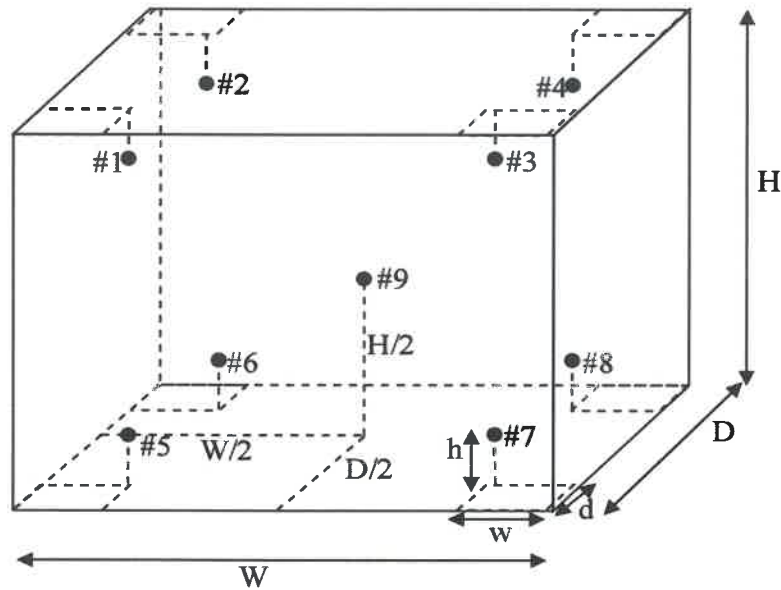

(Mr. Udon Srichana)

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 SPC RT Co., Ltd.



Standard Installation Locations

Volume (Calibration Zone)= 21 (Liters)

Inside chamber: W = 40 (cm) D = 33 (cm) H = 40 (cm)

Standard Locations (#1, #2, #3, #4): w = 5 (cm) d = 5 (cm) h = 5 (cm)

Standard Locations (#5, #6, #7, #8): w = 5 (cm) d = 5 (cm) h = 5 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	1	2	3	4	5	6	7	8	9

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

Certificate No.: C31221187

Page: 3 of 4

Calibration Results:

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	104.13	0.13	0.52
#2	104.12	0.12	0.52
#3	104.45	0.45	0.51
#4	104.22	0.22	0.49
#5	103.87	-0.13	0.56
#6	103.61	-0.39	0.53
#7	103.78	-0.22	0.59
#8	103.73	-0.27	0.51
#9	104.27	0.27	0.51

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.0	104.0	104.13	104.12	104.45	104.22	103.87	103.61	103.78	103.73	104.27	0.59

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.72	0.41	1.51

Note: * Maximum uncertainty of the each position

Certificate No.: C31221187

Page: 4 of 4

Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	180.33	0.33	0.52
#2	179.99	-0.01	0.52
#3	180.88	0.88	0.52
#4	180.17	0.17	0.52
#5	179.92	-0.08	0.52
#6	179.29	-0.71	0.52
#7	178.75	-1.25	0.55
#8	179.40	-0.60	0.52
#9	180.35	0.35	0.52

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
180.0	180.0	180.0	180.33	179.99	180.88	180.17	179.92	179.29	178.75	179.40	180.35	0.55

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	1.79	0.17	2.37

Note: * Maximum uncertainty of the each position

The End of Certificate

Certificate No.: C31221187 Page: 1 of 2

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :**
- ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA
 - ☒ Choice B Non-binary statement with guard band ($w = 1 U$), Specific Risk < 2.5% PFA
 - ☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r U$) .
; PFA – Probability of False Accept



(Mr. Udon Srichana)
Authorized signatory

Without adjustment

Desired Temperature : 104.0°C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured (°C)	Correction of UUC. (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	104.13	0.13	0.52	1.0	Pass
#2	104.12	0.12	0.52	1.0	Pass
#3	104.45	0.45	0.51	1.0	Pass
#4	104.22	0.22	0.49	1.0	Pass
#5	103.87	-0.13	0.56	1.0	Pass
#6	103.61	-0.39	0.53	1.0	Pass
#7	103.78	-0.22	0.59	1.0	Pass
#8	103.73	-0.27	0.51	1.0	Pass
#9	104.27	0.27	0.51	1.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

Certificate No.: C31221187 Page: 2 of 2

Statements of conformity:(Cont.)**Without adjustment (Cont.)**

Desired Temperature : 180.0°C Tolerances : 2.0 °C

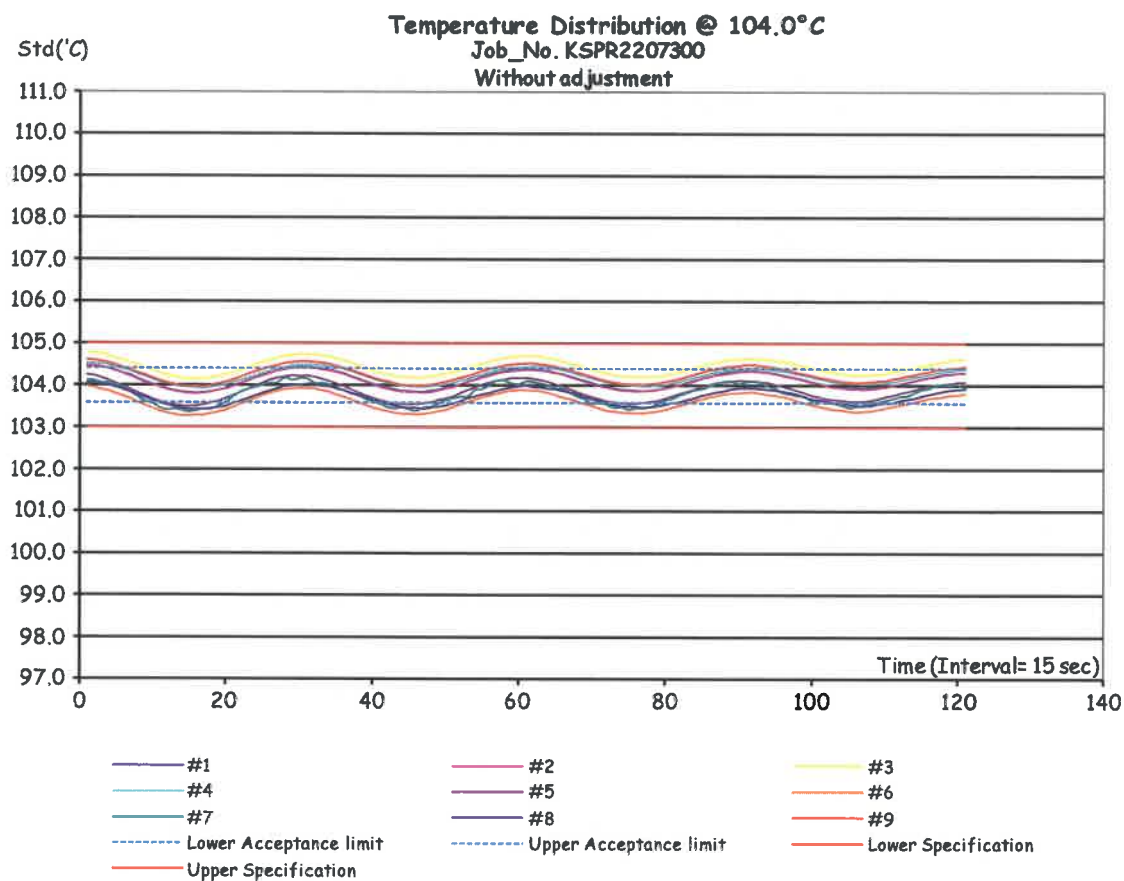
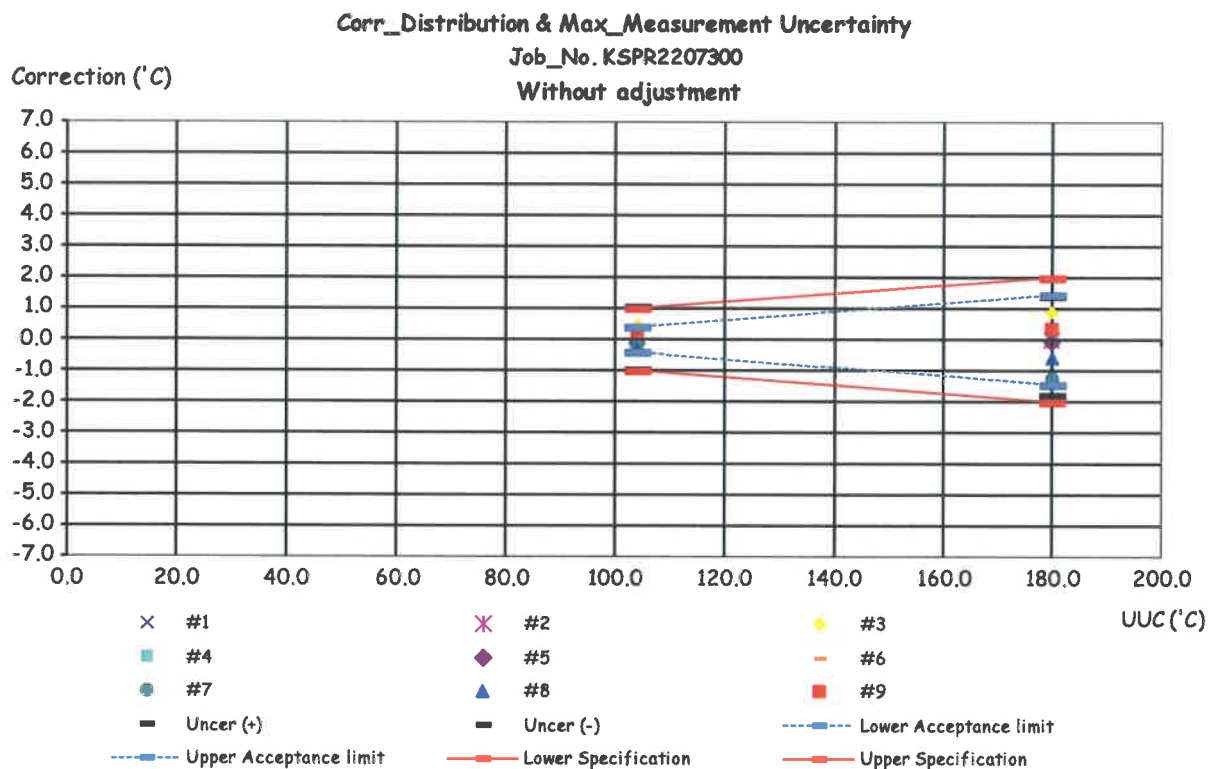
Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured (°C)	Correction of UUC.* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	180.33	0.33	0.52	2.0	Pass
#2	179.99	-0.01	0.52	2.0	Pass
#3	180.88	0.88	0.52	2.0	Pass
#4	180.17	0.17	0.52	2.0	Pass
#5	179.92	-0.08	0.52	2.0	Pass
#6	179.29	-0.71	0.52	2.0	Pass
#7	178.75	-1.25	0.55	2.0	Pass
#8	179.40	-0.60	0.52	2.0	Pass
#9	180.35	0.35	0.52	2.0	Pass

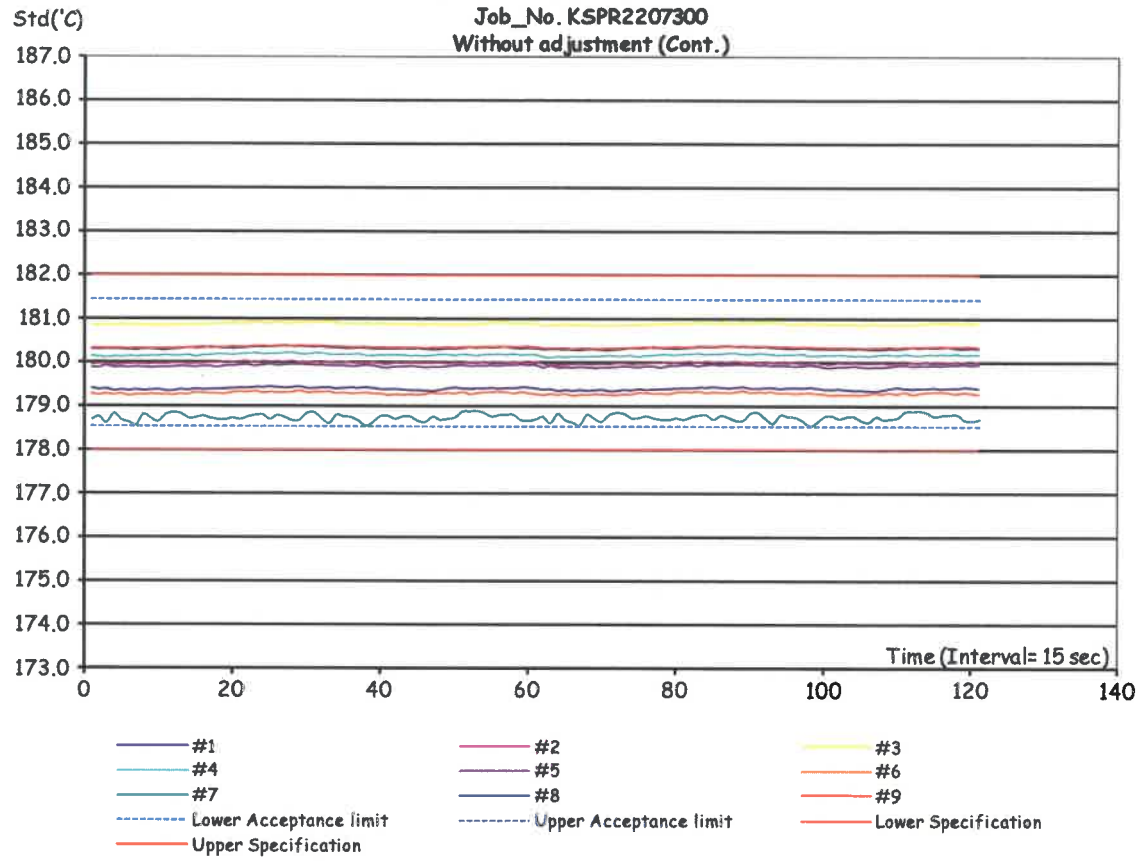
Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity



Temperature Distribution @ 180.0°C
Job_No. KSPR2207300
Without adjustment (Cont.)



ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2207300

ชนิดเครื่องมือ: Hot Air Oven

รุ่น: UF 55

หมายเลขเครื่อง: B215.0024(HO-02)

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
17 Jun 2022			17 Jun 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Ampol Srisumphan

Service Engineer



CERTIFICATE OF CALIBRATION

Customer: ECO CONSULTANT COMPANY LIMITED
32/3-4, Moo.4, Toi koh, Sam kok,
Pathumthani 12160

Manufacturer: Hanon

Model Number: SH420F

Description: Graphite Digester

Asset Number: SH526220249

Serial #: SH526220249

P.O. #: N/A

Procedure: CPTD-05 (Sep, 2020)

Certificate Number: TTH-58350

Temperature: 25 °C

Relative Humidity: 56 %RH

Calibration Location: On-Site

Calibrated By: GAKKAPONG KONGKAMUD

Calibration Date: 22/Sep/2022

Next Due Date: 22/Sep/2023

Condition Received: IN TOLERANCE

Condition Returned: IN TOLERANCE

This certifies that the above instrument was calibrated in compliance with the Calibration System Requirements of ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 (R2002) in accordance with referenced procedures. Standards used to perform this calibration are traceable to SI units; their source of traceability derives from a National Metrology Institute such as NIST, CENAM, NPL, DIN, from natural physical constants, consensus standards or derived by the ratio type of calibrations. Collective uncertainties are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2). Unless otherwise noted calibrations are performed to manufacturer's specifications. Compliance statements are in conformance with ILAC-G8:2019 simple acceptance decision rule. This form shall not be reproduced, except in full, without the expressed written consent of Techmaster. Contact our customer service representative for clarification of this document.

Standards Utilized

Standard #	Description	Manufacturer	Model #	Due Date	Test Report #
5680	Digital Multimeter	Hewlett Packard	3458A	09/Mar/2023	TTH-0-54073-R6
5755	Standard PRTs	FLUKE	5626	29/Jul/2023	TTH-0-57476

Remarks:

W. Chootian

Wannipa Chootian
Quality Assurance

P. Moonmuangsan

Pornthep Moonmuangsan
Technical Manager

N. Homta

Nopparat Homta
Approved By

Issued on: 2022-09-28 20:16:31.9500000 -07:00

TTH-58350



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Page 1 of 2

Calibration Results



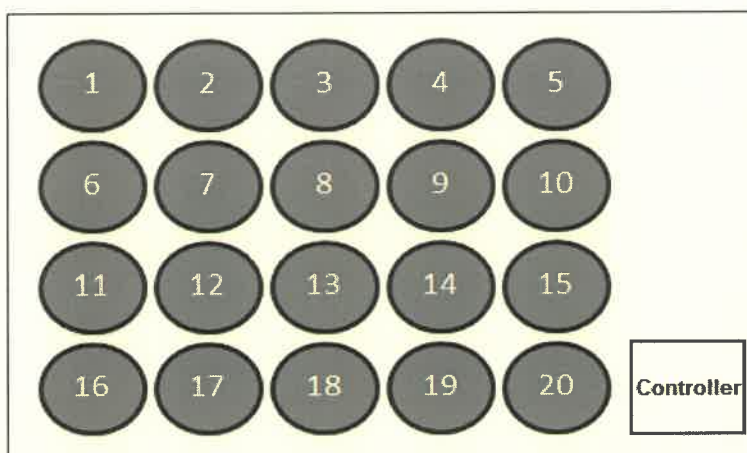
Manufacturer: Hanon
Description: Graphite Digester

Asset No. SH526220249
Serial No. SH526220249

Model # : SH420F

Report No. TTH-58350

Furnace Hole



Temperature Accuracy

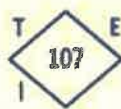
Furnace Hole	UUT Displayed	Measured Value				Uncertainty	Tolerance	
		Resistance	Actual Value	Error	Result		Min	Max
1	380.0 °C	241.4682 Ω	379.54 °C	0.46 °C	Pass	0.30 °C	379.00 °C	381.00 °C
2	380.0 °C	241.4839 Ω	379.59 °C	0.41 °C	Pass	0.30 °C	379.00 °C	381.00 °C
3	380.0 °C	241.4280 Ω	379.43 °C	0.57 °C	Pass	0.30 °C	379.00 °C	381.00 °C
4	380.0 °C	241.4145 Ω	379.39 °C	0.61 °C	Pass	0.30 °C	379.00 °C	381.00 °C
5	380.0 °C	241.4737 Ω	379.56 °C	0.44 °C	Pass	0.30 °C	379.00 °C	381.00 °C
6	380.0 °C	241.4305 Ω	379.44 °C	0.56 °C	Pass	0.30 °C	379.00 °C	381.00 °C
7	380.0 °C	241.4365 Ω	379.45 °C	0.55 °C	Pass	0.30 °C	379.00 °C	381.00 °C
8	380.0 °C	241.4084 Ω	379.37 °C	0.63 °C	Pass	0.30 °C	379.00 °C	381.00 °C
9	380.0 °C	241.4041 Ω	379.36 °C	0.64 °C	Pass	0.30 °C	379.00 °C	381.00 °C
10	380.0 °C	241.4663 Ω	379.54 °C	0.46 °C	Pass	0.30 °C	379.00 °C	381.00 °C
11	380.0 °C	241.4313 Ω	379.44 °C	0.56 °C	Pass	0.30 °C	379.00 °C	381.00 °C
12	380.0 °C	241.5030 Ω	379.64 °C	0.36 °C	Pass	0.30 °C	379.00 °C	381.00 °C
13	380.0 °C	241.4577 Ω	379.51 °C	0.49 °C	Pass	0.30 °C	379.00 °C	381.00 °C
14	380.0 °C	241.6011 Ω	379.92 °C	0.08 °C	Pass	0.30 °C	379.00 °C	381.00 °C
15	380.0 °C	241.4752 Ω	379.56 °C	0.44 °C	Pass	0.30 °C	379.00 °C	381.00 °C
16	380.0 °C	241.5588 Ω	379.80 °C	0.20 °C	Pass	0.30 °C	379.00 °C	381.00 °C
17	380.0 °C	241.3959 Ω	379.34 °C	0.66 °C	Pass	0.30 °C	379.00 °C	381.00 °C
18	380.0 °C	241.4577 Ω	379.51 °C	0.49 °C	Pass	0.30 °C	379.00 °C	381.00 °C
19	380.0 °C	241.4482 Ω	379.49 °C	0.51 °C	Pass	0.30 °C	379.00 °C	381.00 °C
20	380.0 °C	241.4709 Ω	379.55 °C	0.45 °C	Pass	0.30 °C	379.00 °C	381.00 °C

Notes : - The calibration results are verified its tolerance with the manufacturer's specification.

- The instrument was calibrated for the parameter and at the points specified by the customer.

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TTH-58350



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Page 2 of 2

ประจำเดือนพฤษภาคม พ.ศ. 2566



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CH1650

Page.: 1 of 3

Certificate of Calibration

Equipment :	pH Meter
Manufacturer :	Mettler Toledo
Model :	Five Easy
Serial No. :	B617389478
ID No. :	PH-02
Condition As-Received:	Used Item
Received Date :	29 November 2022
Calibration Date :	30 November 2022
Reference :	2211-1001WN-1
Submitted by :	Hi-Tech Utilities Corp.,Ltd. 61 Moo 1 Tambol Banlen, A.Bangpa-In, Ayutthaya 13160
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure :	In - house method : - CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM) - CP-CH8 by comparison with standard thermometer

Calibrated by : Walalak Sirithean

Approved by :


Approved Signatory

- (☒) Malee Butkruea
(☐) Saithip Meangmai
(☐) Warakorn Lerngagtrakul

Issue Date : 1 December 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0048267



Cert.No.: 22CH1650

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023
2) Ref. Standard Thermometer	4982054	110RC044	22I1306	27 Oct 2023

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

- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	823320	20 June 2024
pH 6.987	CPA chem	823322	20 June 2023
pH 10.008	CPA chem	826590	09 July 2023

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: B617389478	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.01	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00

Malu



Cert.No.: 22CH1650

Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode S/N.: 2255776	4.008	4.02	173	0.0086	2.05
	6.987	6.99	2	0.011	2.00
	10.008	10.01	-172	0.0096	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : LE438
- Serial No. : 2255776

Dimension of probe;

- Length : 12 mm.
- Diameter : 120 mm.
- Immersion Depth : 100 mm.

Calibration Point ($^{\circ}\text{C}$)	Standard Temperature ($^{\circ}\text{C}$)	UUC* Reading ($^{\circ}\text{C}$)	Error ($^{\circ}\text{C}$)	Uncertainty of measurement (\pm $^{\circ}\text{C}$)	Coverage factor k
25.0	25.000	25.1	0.100	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

-o0o-

Mali.



Certificate of Calibration

Equipment: Balance
Model: PA214
Serial No. (or ID.): B416510537 (BA-02)
Manufacturer: Ohaus
Condition: In condition

Certificate No.: C01223748
Issued Date: 10 December 2022
Job No.: KSPR2215298
Page: 1 of 3

Customer: ECO CONSULTANT COMPANY LIMITED.
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Environment Condition: Temperature 23 °C ± 0.6 °C
Humidity 62 %RH ± 3.4 %RH

Calibration Place: ECO CONSULTANT COMPANY LIMITED. (ห้องเครื่องชั่ง)
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Calibration By: Mr. Atachai Ngamchanat

Calibration Date: 09 December 2022

The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02221865



(Mr. Atachai Ngamchanat)

Person in charge



(Mr. Rungrod Jenkitrakulchai)

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.

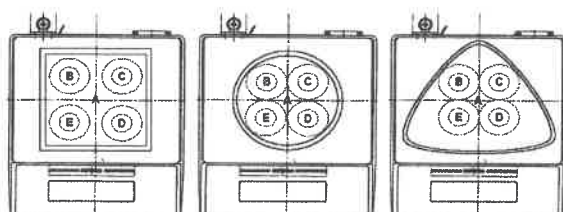
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

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.

Calibration Results:

Before Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

			Nominal Test Value		100	(g)	
Reference Points (g)							
A		B		C		D	E
-		0.0000		-0.0001		0.0001	0.0001

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

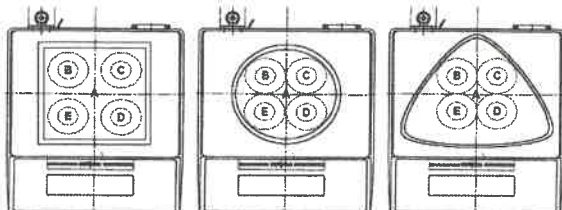
Nominal test value (g)	Standard Deviation
20	0.00005
200	0.00008

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.5	0.50001	0.5000	0.0000	0.00013	2.09
1	1.00002	1.0000	0.0000	0.00013	2.09
2	2.00001	2.0000	0.0000	0.00013	2.09
5	5.00002	4.9999	-0.0001	0.00013	2.08
10	10.00001	9.9999	-0.0001	0.00013	2.08
20	20.00002	19.9998	-0.0002	0.00013	2.07
50	50.00001	49.9995	-0.0005	0.00015	2.05
100	100.00006	99.9993	-0.0008	0.00019	2.02
120	120.00008	119.9992	-0.0009	0.00022	2.01
150	150.00007	149.9988	-0.0013	0.00025	2.01
200	199.99991	199.9982	-0.0017	0.00030	2.00

After Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

			Nominal Test Value		100	(g)
Reference Points (g)						
A	B	C	D	E		
-	0.0001	0.0000	-0.0001	0.0001		

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
20	0.00005
200	0.00007

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

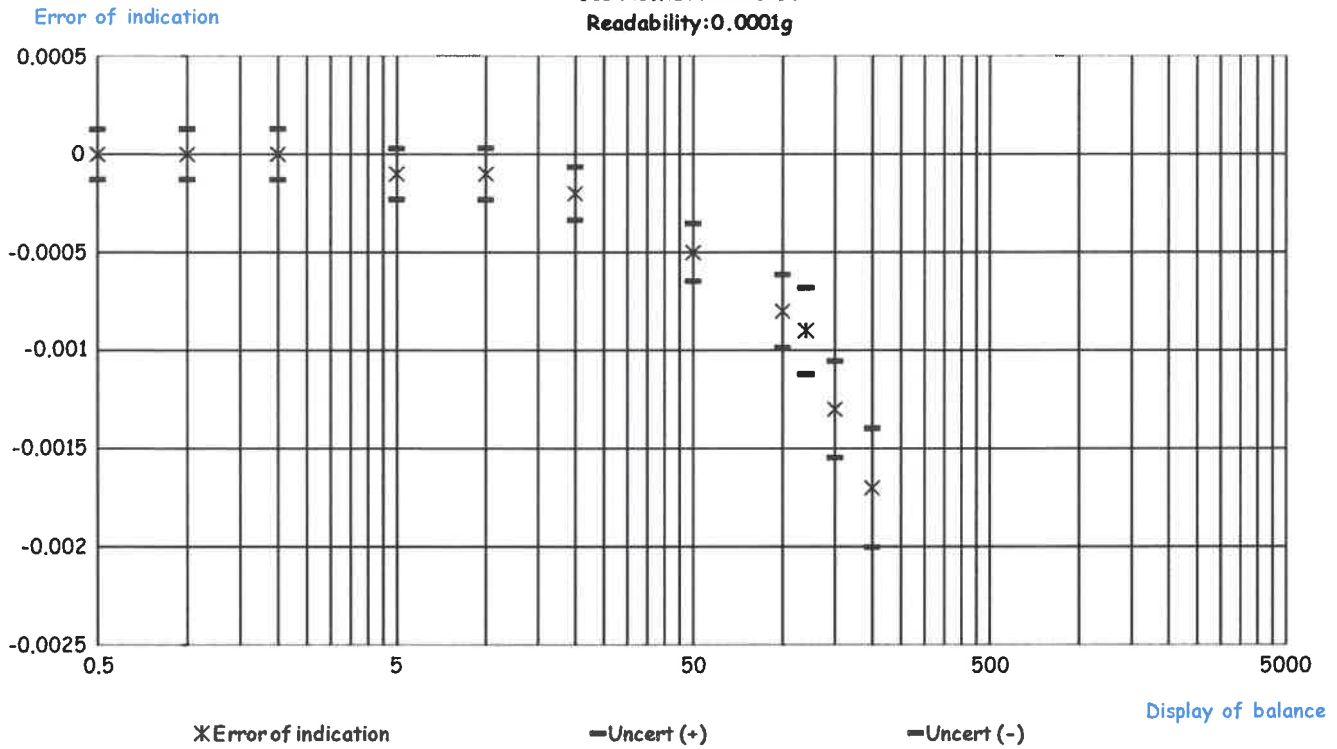
Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.5	0.50001	0.5000	0.0000	0.00012	2.07
1	1.00002	1.0000	0.0000	0.00012	2.07
2	2.00001	2.0000	0.0000	0.00012	2.07
5	5.00002	5.0000	0.0000	0.00012	2.06
10	10.00001	10.0000	0.0000	0.00012	2.06
20	20.00002	20.0000	0.0000	0.00013	2.05
50	50.00001	50.0000	0.0000	0.00014	2.03
100	100.00006	100.0001	0.0000	0.00018	2.01
120	120.00008	120.0002	0.0001	0.00021	2.01
150	150.00007	150.0002	0.0001	0.00024	2.00
200	199.99991	200.0000	0.0001	0.00030	2.00

The End of Certificate

Before Adjustment

Job No. KSPR2215298

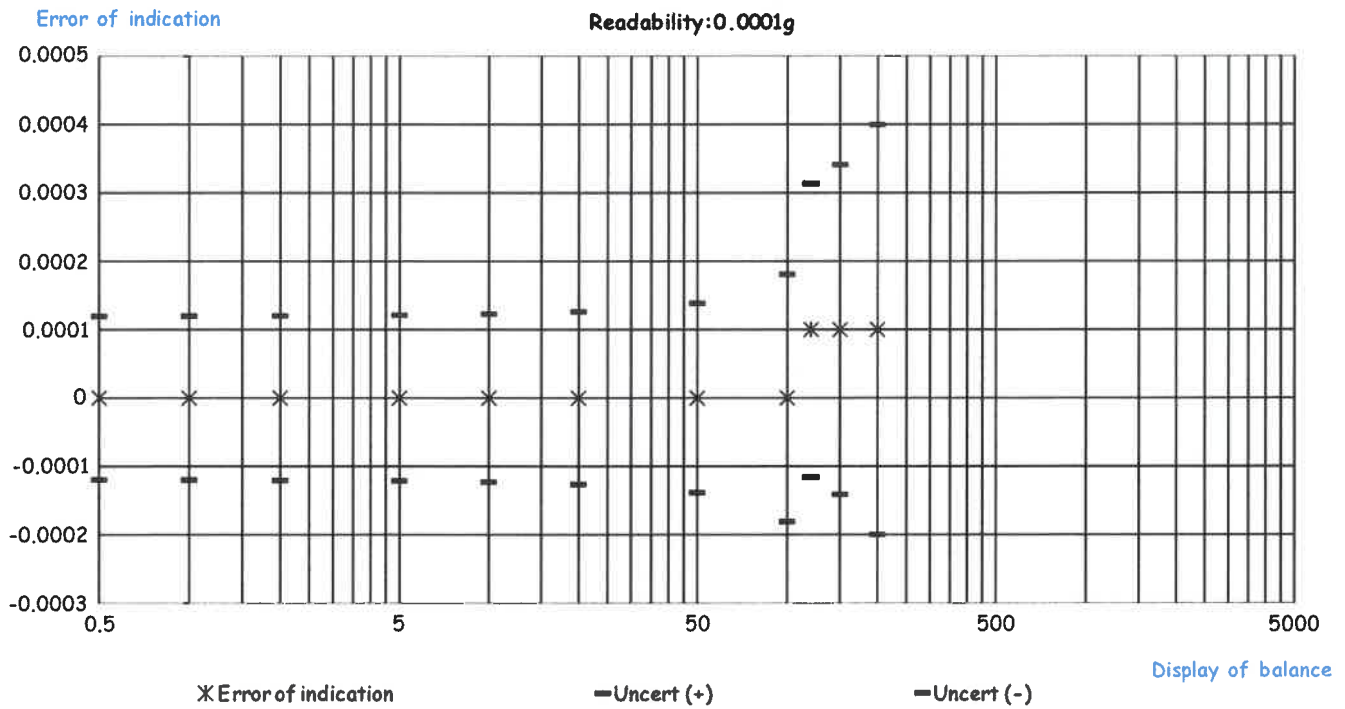
Readability: 0.0001g



After Adjust

Job No. KSPR2215298

Readability: 0.0001g



ใบตรวจสอบสภาพเครื่องชั่ง

เลขที่ใบงาน: KSPR2215298

ชนิดเครื่องมือ: Balance

รุ่น: PA214

หมายเลขเครื่อง: B416510537

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
09 Dec 2022			09 Dec 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดกระจกกันลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. ความสมบูรณ์ชุดของระดับน้ำ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของขาตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การตอบสนองของปุ่มกด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การแสดงผลของ Display หลังวางน้ำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองจานชั่ง (Stopper) / pan support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของตัวเครื่องภายนอกและแกน load cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติม/ข้อแนะนำ :

Mr. Atachai Ngamchanat

Service Engineer



Certificate of Calibration

Equipment:	Hot Air Oven	Certificate No.:	C31221187
Model:	UF 55	Issued Date:	18 June 2022
Serial No.(or ID):	B215.0024(HO-02)	Job No.:	KSPR2207300
Manufacturer:	Memmert	Page:	1 of 4
Condition:	In Condition	Ventilation Valve:	Closed
Shelves(pc.):	1		

Customer: ECO CONSULTANT COMPANY LIMITED.
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Environment Condition:

Temperature:	25 °C	±	0.9 °C
Humidity:	59 %RH	±	3.7 %RH
Voltage:	223 VAC	±	3.6 VAC


Calibration Place: ECO CONSULTANT COMPANY LIMITED. (ห้องปฏิบัติการวิเคราะห์ ชั้น 2)
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Calibration By: Mr. Ampol Srisumphan

Calibration Date: 17 June 2022


The Method used: In house method, SPCC-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C10220004


(Mr. Ampol Srisumphan)

Person in charge


บริษัท เอสพีซี อาร์ที จำกัด
SPC RT Co., Ltd.

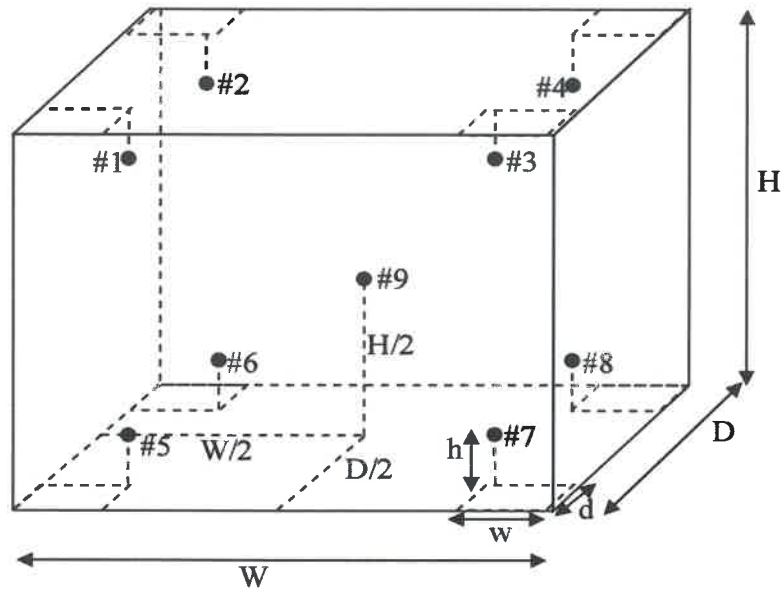

(Mr. Udon Srichana)

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 SPC RT Co., Ltd.



Standard Installation Locations

Volume (Calibration Zone)= 21 (Liters)

Inside chamber: $W = 40$ (cm) $D = 33$ (cm) $H = 40$ (cm)

Standard Locations (#1, #2, #3, #4): $w = 5$ (cm) $d = 5$ (cm) $h = 5$ (cm)

Standard Locations (#5, #6, #7, #8): $w = 5$ (cm) $d = 5$ (cm) $h = 5$ (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	1	2	3	4	5	6	7	8	9

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

Certificate No.: C31221187

Page: 3 of 4

Calibration Results:

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	104.13	0.13	0.52
#2	104.12	0.12	0.52
#3	104.45	0.45	0.51
#4	104.22	0.22	0.49
#5	103.87	-0.13	0.56
#6	103.61	-0.39	0.53
#7	103.78	-0.22	0.59
#8	103.73	-0.27	0.51
#9	104.27	0.27	0.51

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.0	104.0	104.13	104.12	104.45	104.22	103.87	103.61	103.78	103.73	104.27	0.59

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.72	0.41	1.51

Note: * Maximum uncertainty of the each position

Certificate No.: C31221187

Page: 4 of 4

Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	180.33	0.33	0.52
#2	179.99	-0.01	0.52
#3	180.88	0.88	0.52
#4	180.17	0.17	0.52
#5	179.92	-0.08	0.52
#6	179.29	-0.71	0.52
#7	178.75	-1.25	0.55
#8	179.40	-0.60	0.52
#9	180.35	0.35	0.52

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
180.0	180.0	180.0	180.33	179.99	180.88	180.17	179.92	179.29	178.75	179.40	180.35	0.55

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	1.79	0.17	2.37

Note: * Maximum uncertainty of the each position

The End of Certificate

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :**
- ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA
 - ☒ Choice B Non-binary statement with guard band ($w = 1 U$), Specific Risk < 2.5% PFA
 - ☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r U$) .
; PFA – Probability of False Accept



(Mr. Udon Srichana)
Authorized signatory

Without adjustment

Desired Temperature : 104.0°C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured (°C)	Correction of UUC. (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	104.13	0.13	0.52	1.0	Pass
#2	104.12	0.12	0.52	1.0	Pass
#3	104.45	0.45	0.51	1.0	Pass
#4	104.22	0.22	0.49	1.0	Pass
#5	103.87	-0.13	0.56	1.0	Pass
#6	103.61	-0.39	0.53	1.0	Pass
#7	103.78	-0.22	0.59	1.0	Pass
#8	103.73	-0.27	0.51	1.0	Pass
#9	104.27	0.27	0.51	1.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

Certificate No.: C31221187 Page: 2 of 2

Statements of conformity:(Cont.)**Without adjustment (Cont.)**

Desired Temperature : 180.0°C Tolerances : 2.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured (°C)	Correction of UUC.* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	180.33	0.33	0.52	2.0	Pass
#2	179.99	-0.01	0.52	2.0	Pass
#3	180.88	0.88	0.52	2.0	Pass
#4	180.17	0.17	0.52	2.0	Pass
#5	179.92	-0.08	0.52	2.0	Pass
#6	179.29	-0.71	0.52	2.0	Pass
#7	178.75	-1.25	0.55	2.0	Pass
#8	179.40	-0.60	0.52	2.0	Pass
#9	180.35	0.35	0.52	2.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

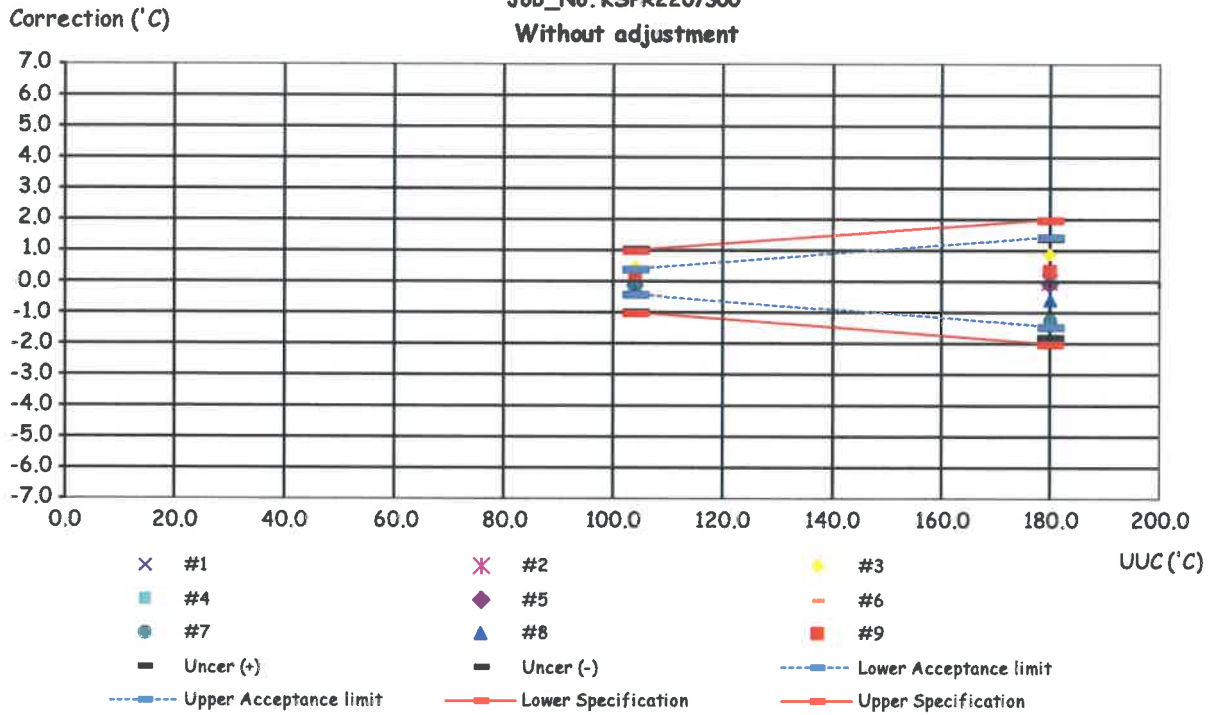
The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity

Corr_Distribution & Max_Measurement Uncertainty

Job_No. KSPR2207300

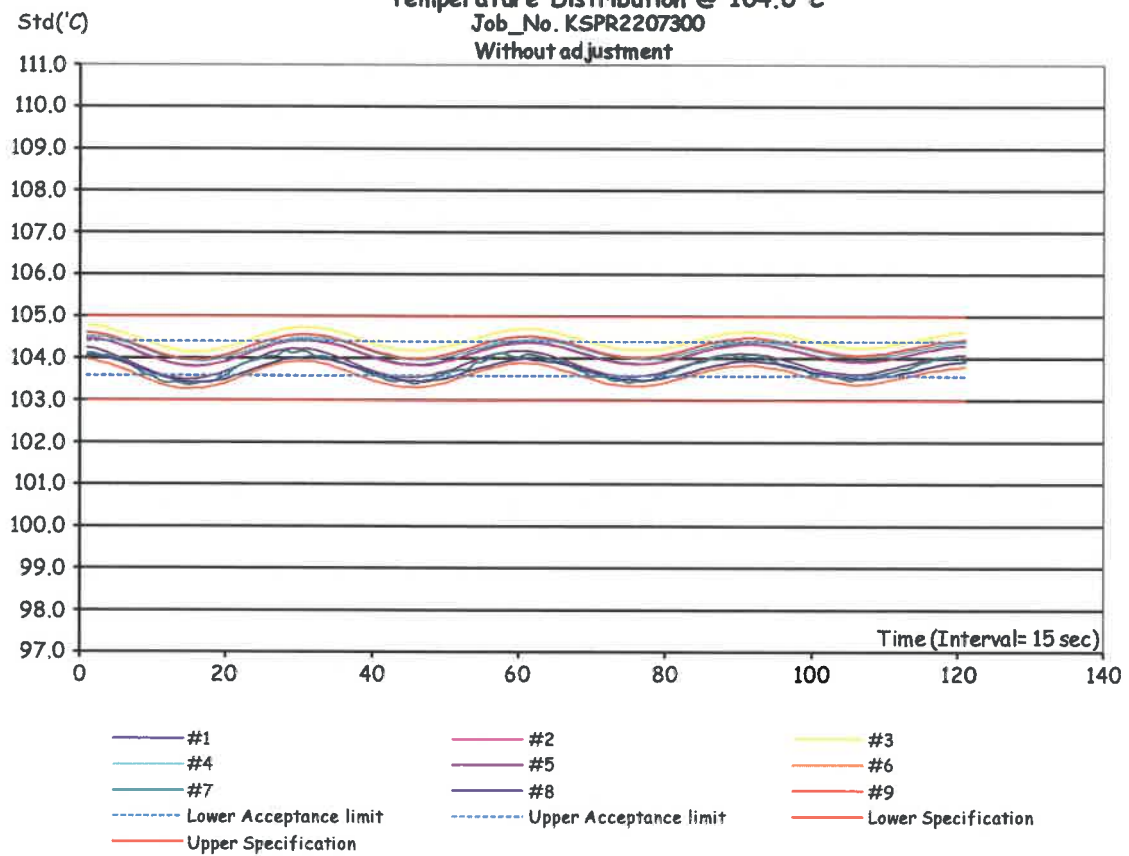
Without adjustment



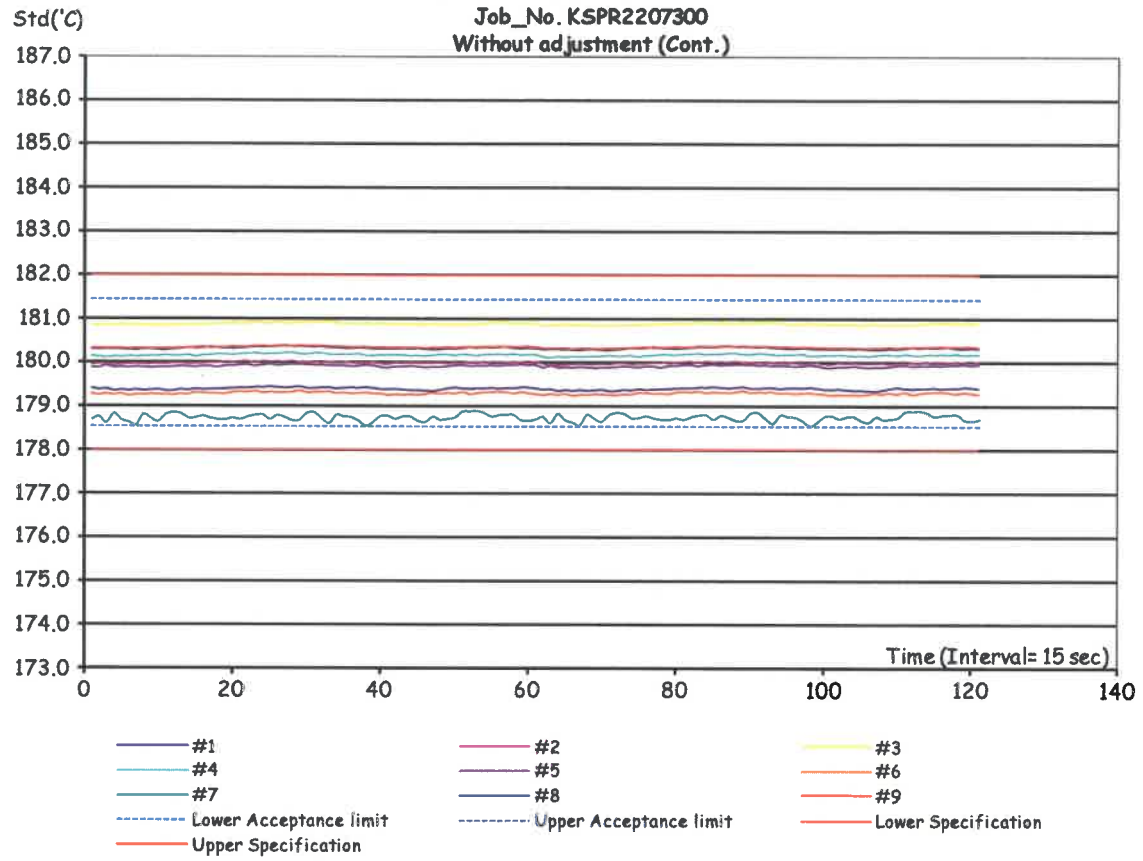
Temperature Distribution @ 104.0°C

Job_No. KSPR2207300

Without adjustment



Temperature Distribution @ 180.0°C
Job_No. KSPR2207300
Without adjustment (Cont.)



ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2207300

ชนิดเครื่องมือ: Hot Air Oven

รุ่น: UF 55

หมายเลขเครื่อง: B215.0024(HO-02)

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
17 Jun 2022			17 Jun 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Ampol Srisumphan

Service Engineer

CERTIFICATE OF CALIBRATION

Customer: ECO CONSULTANT COMPANY LIMITED
 32/3-4, Moo.4, Toi koh, Sam kok,
 Pathumthani 12160

Manufacturer: Hanon

Model Number: SH420F

Description: Graphite Digester

Asset Number: SH526220249

Serial #: SH526220249

P.O. #: N/A

Procedure: CPTD-05 (Sep, 2020)

Certificate Number: TTH-58350

Temperature: 25 °C

Relative Humidity: 56 %RH

Calibration Location: On-Site

Calibrated By: GAKKAPONG KONGKAMUD

Calibration Date: 22/Sep/2022

Next Due Date: 22/Sep/2023

Condition Received: IN TOLERANCE

Condition Returned: IN TOLERANCE

This certifies that the above instrument was calibrated in compliance with the Calibration System Requirements of ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 (R2002) in accordance with referenced procedures. Standards used to perform this calibration are traceable to SI units; their source of traceability derives from a National Metrology Institute such as NIST, CENAM, NPL, DIN, from natural physical constants, consensus standards or derived by the ratio type of calibrations. Collective uncertainties are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2). Unless otherwise noted calibrations are performed to manufacturer's specifications. Compliance statements are in conformance with ILAC-G8:2019 simple acceptance decision rule. This form shall not be reproduced, except in full, without the expressed written consent of Techmaster. Contact our customer service representative for clarification of this document.

Standards Utilized

Standard #	Description	Manufacturer	Model #	Due Date	Test Report #
5680	Digital Multimeter	Hewlett Packard	3458A	09/Mar/2023	TTH-0-54073-R6
5755	Standard PRTs	FLUKE	5626	29/Jul/2023	TTH-0-57476

Remarks:

W. Chootian

Wannipa Chootian
 Quality Assurance

P. Moonmuangsan

Pornthep Moonmuangsan
 Technical Manager

N. Homta

Nopparat Homta
 Approved By

Issued on: 2022-09-28 20:16:31.9500000 -07:00

540.1 2105

TTH-58350



Page 1 of 2

Calibration Results



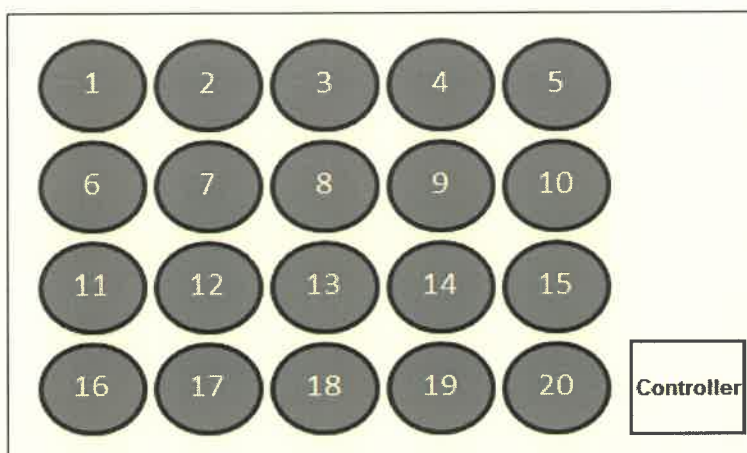
Manufacturer: Hanon
Description: Graphite Digester

Asset No. SH526220249
Serial No. SH526220249

Model # : SH420F

Report No. TTH-58350

Furnace Hole



Temperature Accuracy

Furnace Hole	UUT Displayed	Measured Value				Uncertainty	Tolerance	
		Resistance	Actual Value	Error	Result		Min	Max
1	380.0 °C	241.4682 Ω	379.54 °C	0.46 °C	Pass	0.30 °C	379.00 °C	381.00 °C
2	380.0 °C	241.4839 Ω	379.59 °C	0.41 °C	Pass	0.30 °C	379.00 °C	381.00 °C
3	380.0 °C	241.4280 Ω	379.43 °C	0.57 °C	Pass	0.30 °C	379.00 °C	381.00 °C
4	380.0 °C	241.4145 Ω	379.39 °C	0.61 °C	Pass	0.30 °C	379.00 °C	381.00 °C
5	380.0 °C	241.4737 Ω	379.56 °C	0.44 °C	Pass	0.30 °C	379.00 °C	381.00 °C
6	380.0 °C	241.4305 Ω	379.44 °C	0.56 °C	Pass	0.30 °C	379.00 °C	381.00 °C
7	380.0 °C	241.4365 Ω	379.45 °C	0.55 °C	Pass	0.30 °C	379.00 °C	381.00 °C
8	380.0 °C	241.4084 Ω	379.37 °C	0.63 °C	Pass	0.30 °C	379.00 °C	381.00 °C
9	380.0 °C	241.4041 Ω	379.36 °C	0.64 °C	Pass	0.30 °C	379.00 °C	381.00 °C
10	380.0 °C	241.4663 Ω	379.54 °C	0.46 °C	Pass	0.30 °C	379.00 °C	381.00 °C
11	380.0 °C	241.4313 Ω	379.44 °C	0.56 °C	Pass	0.30 °C	379.00 °C	381.00 °C
12	380.0 °C	241.5030 Ω	379.64 °C	0.36 °C	Pass	0.30 °C	379.00 °C	381.00 °C
13	380.0 °C	241.4577 Ω	379.51 °C	0.49 °C	Pass	0.30 °C	379.00 °C	381.00 °C
14	380.0 °C	241.6011 Ω	379.92 °C	0.08 °C	Pass	0.30 °C	379.00 °C	381.00 °C
15	380.0 °C	241.4752 Ω	379.56 °C	0.44 °C	Pass	0.30 °C	379.00 °C	381.00 °C
16	380.0 °C	241.5588 Ω	379.80 °C	0.20 °C	Pass	0.30 °C	379.00 °C	381.00 °C
17	380.0 °C	241.3959 Ω	379.34 °C	0.66 °C	Pass	0.30 °C	379.00 °C	381.00 °C
18	380.0 °C	241.4577 Ω	379.51 °C	0.49 °C	Pass	0.30 °C	379.00 °C	381.00 °C
19	380.0 °C	241.4482 Ω	379.49 °C	0.51 °C	Pass	0.30 °C	379.00 °C	381.00 °C
20	380.0 °C	241.4709 Ω	379.55 °C	0.45 °C	Pass	0.30 °C	379.00 °C	381.00 °C

Notes : - The calibration results are verified its tolerance with the manufacturer's specification.

- The instrument was calibrated for the parameter and at the points specified by the customer.

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TTH-58350



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Page 2 of 2

ประจำเดือนมิถุนายน พ.ศ. 2566



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CH1650

Page.: 1 of 3

Certificate of Calibration

Equipment :	pH Meter
Manufacturer :	Mettler Toledo
Model :	Five Easy
Serial No. :	B617389478
ID No. :	PH-02
Condition As-Received:	Used Item
Received Date :	29 November 2022
Calibration Date :	30 November 2022
Reference :	2211-1001WN-1
Submitted by :	Hi-Tech Utilities Corp.,Ltd. 61 Moo 1 Tambol Banlen, A.Bangpa-In, Ayutthaya 13160
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure :	In - house method : - CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM) - CP-CH8 by comparison with standard thermometer

Calibrated by : Walalak Sirithean

Approved by :


Approved Signatory

- (☒) Malee Butkruea
(☐) Saithip Meangmai
(☐) Warakorn Lerngagtrakul

Issue Date : 1 December 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0048267



Cert.No.: 22CH1650

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023
2) Ref. Standard Thermometer	4982054	110RC044	22I1306	27 Oct 2023

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

- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	823320	20 June 2024
pH 6.987	CPA chem	823322	20 June 2023
pH 10.008	CPA chem	826590	09 July 2023

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

<u>Unit Under Calibration</u>	<u>Nominal Value</u>	<u>Standard Voltage Input</u>	<u>Actual Reading</u>		<u>Uncertainty of Measurement</u> (±mV)	<u>Coverage factor</u> <i>k</i>
	<u>pH</u>	<u>mV</u>	<u>mV</u>	<u>pH</u>		
pH Meter S/N.: B617389478	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.01	0.58	2.00
	10.00	-177.48	-177	10.01	0.58	2.00

Malu



Cert.No.: 22CH1650

Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode S/N.: 2255776	4.008	4.02	173	0.0086	2.05
	6.987	6.99	2	0.011	2.00
	10.008	10.01	-172	0.0096	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : LE438
- Serial No. : 2255776

Dimension of probe;

- Length : 12 mm.
- Diameter : 120 mm.
- Immersion Depth : 100 mm.

Calibration Point ($^{\circ}\text{C}$)	Standard Temperature ($^{\circ}\text{C}$)	UUC* Reading ($^{\circ}\text{C}$)	Error ($^{\circ}\text{C}$)	Uncertainty of measurement (\pm $^{\circ}\text{C}$)	Coverage factor k
25.0	25.000	25.1	0.100	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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Certificate of Calibration

Equipment:	Cooled Incubator	Certificate No.:	C31221188
Model:	i250	Issued Date:	20 June 2022
Serial No.(or ID):	0408-0215-0017 (CI-01)	Job No.:	KSPR2207301
Manufacturer:	Accuplus	Page:	1 of 4
Condition:	In Condition	Ventilation Valve:	None
Shelves(pc.):	4		

Customer: ECO CONSULTANT COMPANY LIMITED.
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Environment Condition:

Temperature:	26 °C	±	0.9 °C
Humidity:	60 %RH	±	4.2 %RH
Voltage:	223 VAC	±	3.4 VAC

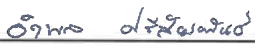
Calibration Place: ECO CONSULTANT COMPANY LIMITED. (ห้องปฏิบัติการวิเคราะห์ ชั้น 2)
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Calibration By: Mr. Ampol Srisumphan

Calibration Date: 17 June 2022


The Method used: In house method, SPCC-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C10220004


(Mr. Ampol Srisumphan)

Person in charge


บริษัท เอสพีซี อาร์ที จำกัด
SPC RT Co., Ltd

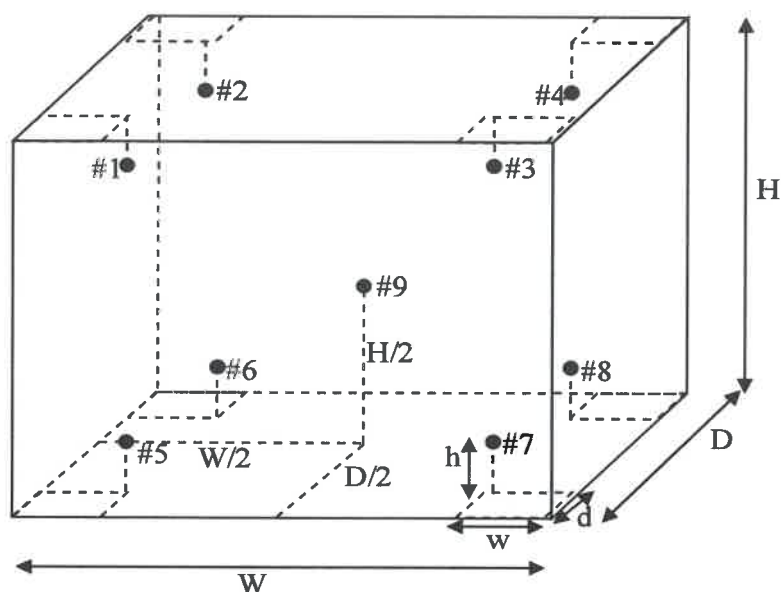

(Mr. Udon Srichana)

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 SPC RT Co., Ltd.



Standard Installation Locations

Volume (Calibration Zone)= 102 (Liters)

Inside chamber:	W = 50 (cm)	D = 44 (cm)	H = 119 (cm)
Standard Locations (#1, #2, #3, #4):	w = 5 (cm)	d = 5 (cm)	h = 32 (cm)
Standard Locations (#5, #6, #7, #8):	w = 5 (cm)	d = 5 (cm)	h = 12 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	1	2	3	4	5	6	7	8	9

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

Certificate No.: C31221188

Page: 3 of 4

Calibration Results:**Without adjustment**

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 2.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	4.26	2.26	0.51
#2	3.51	1.51	0.52
#3	2.60	0.60	0.52
#4	2.73	0.73	0.51
#5	3.29	1.29	0.51
#6	2.80	0.80	0.51
#7	2.41	0.41	0.51
#8	2.64	0.64	0.51
#9	2.32	0.32	0.51

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
3.0	2.0	2.0	4.26	3.51	2.60	2.73	3.29	2.80	2.41	2.64	2.32	0.52

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
2.0	2.01	0.13	2.09

Note: * Maximum uncertainty of the each position

Certificate No.: C31221188

Page: 4 of 4

Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	20.68	0.68	0.34
#2	20.37	0.37	0.33
#3	19.98	-0.02	0.45
#4	20.15	0.15	0.35
#5	20.16	0.16	0.36
#6	20.14	0.14	0.36
#7	19.84	-0.16	0.35
#8	19.84	-0.16	0.38
#9	19.80	-0.20	0.39

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
20.0	20.0	20.0	20.68	20.37	19.98	20.15	20.16	20.14	19.84	19.84	19.80	0.45

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
20.0	0.95	0.30	1.27

Note: * Maximum uncertainty of the each position

The End of Certificate

Certificate No.: C31221188 Page: 1 of 2

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :** ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA
- ☒ Choice B Non-binary statement with guard band ($w = 1 U$), Specific Risk < 2.5% PFA
- ☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r U$) .
- ; PFA – Probability of False Accept




(Mr. Udon Srichana)

Authorized signatory

Without adjustment

Desired Temperature : 3.0°C Tolerances : 3.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 2.0 °C

Locations	Measured (°C)	Correction of UUC. (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	4.26	1.26	0.51	3.0	Pass
#2	3.51	0.51	0.52	3.0	Pass
#3	2.60	-0.40	0.52	3.0	Pass
#4	2.73	-0.27	0.51	3.0	Pass
#5	3.29	0.29	0.51	3.0	Pass
#6	2.80	-0.20	0.51	3.0	Pass
#7	2.41	-0.59	0.51	3.0	Pass
#8	2.64	-0.36	0.51	3.0	Pass
#9	2.32	-0.68	0.51	3.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

Certificate No.: C31221188 Page: 2 of 2

Statements of conformity:(Cont.)**Without adjustment (Cont.)**

Desired Temperature : 20.0°C Tolerances : 3.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured (°C)	Correction of UUC.* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	20.68	0.68	0.34	3.0	Pass
#2	20.37	0.37	0.33	3.0	Pass
#3	19.98	-0.02	0.45	3.0	Pass
#4	20.15	0.15	0.35	3.0	Pass
#5	20.16	0.16	0.36	3.0	Pass
#6	20.14	0.14	0.36	3.0	Pass
#7	19.84	-0.16	0.35	3.0	Pass
#8	19.84	-0.16	0.38	3.0	Pass
#9	19.80	-0.20	0.39	3.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

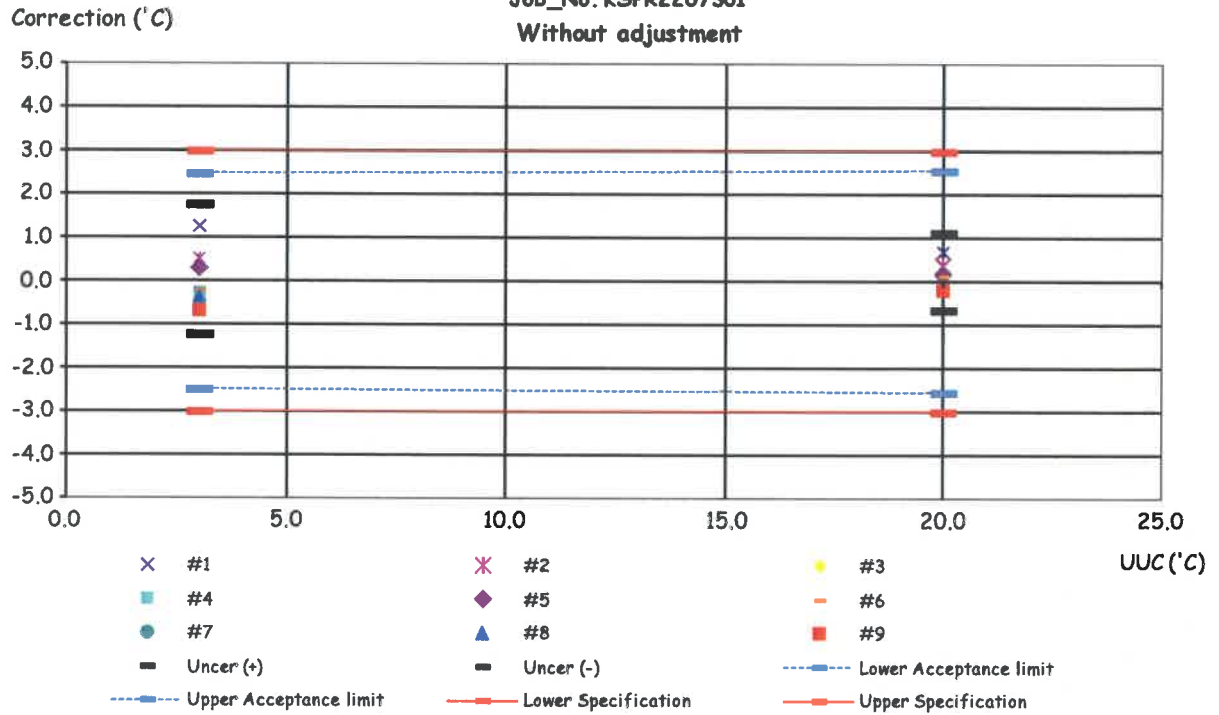
The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity

Corr_Distribution & Max_Measurement Uncertainty

Job_No. KSPR2207301

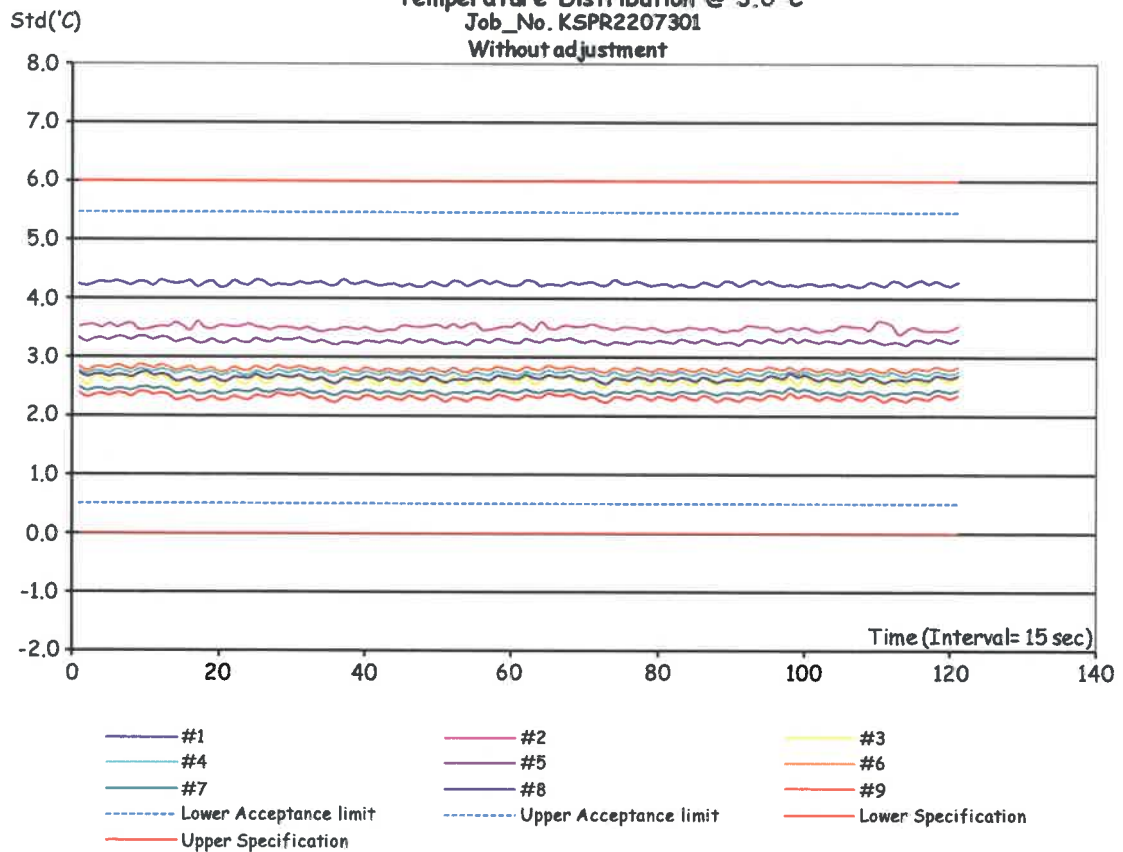
Without adjustment



Temperature Distribution @ 3.0°C

Job_No. KSPR2207301

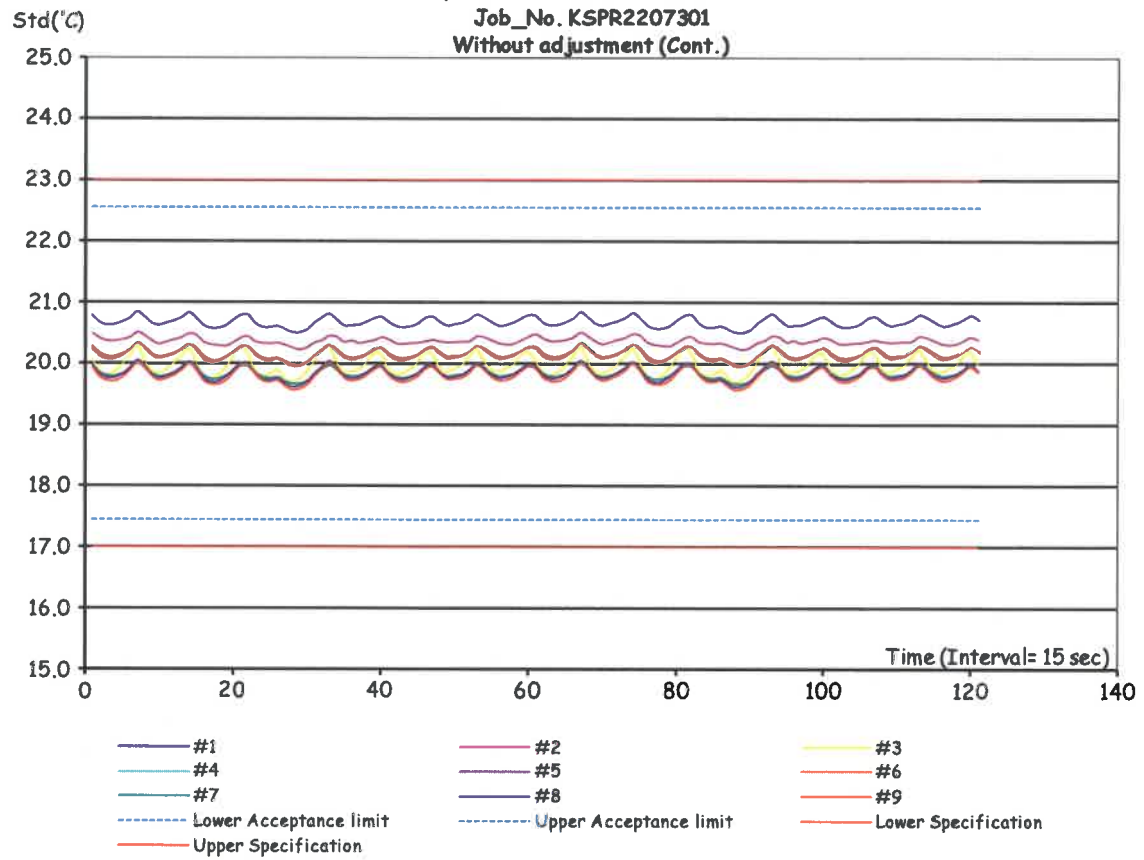
Without adjustment



Temperature Distribution @ 20.0°C

Job_No. KSPR2207301

Without adjustment (Cont.)



ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2207301

ชนิดเครื่องมือ: Cooled Incubator

รุ่น: i250

หมายเลขเครื่อง: 0408-0215-0017 (CI-01)

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
17 Jun 2022			17 Jun 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Ampol Srisumphan

Service Engineer



Certificate of Calibration

Equipment:	Balance	Certificate No.:	C01223748
Model:	PA214	Issued Date:	10 December 2022
Serial No. (or ID.):	B416510537 (BA-02)	Job No.:	KSPR2215298
Manufacturer:	Ohaus	Page:	1 of 3
Condition:	In condition		

Customer: ECO CONSULTANT COMPANY LIMITED.
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Environment Condition: Temperature 23 °C ± 0.6 °C
Humidity 62 %RH ± 3.4 %RH

Calibration Place: ECO CONSULTANT COMPANY LIMITED. (ห้องเครื่องชั่ง)
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Calibration By: Mr. Atachai Ngamchanat

Calibration Date: 09 December 2022

The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02221865



(Mr. Atachai Ngamchanat)

Person in charge



(Mr. Rungrod Jenkitrakulchai)

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.

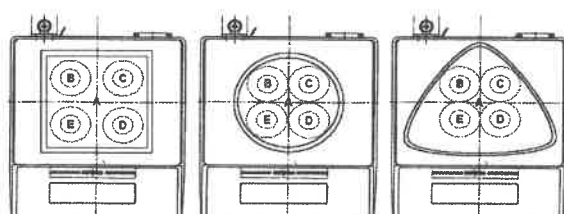
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

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.

Calibration Results:

Before Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

			Nominal Test Value		100	(g)
Reference Points (g)						
A	B	C	D	E		
-	0.0000	-0.0001	0.0001	0.0001		

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

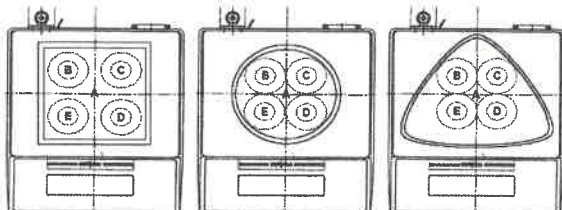
Nominal test value (g)	Standard Deviation
20	0.00005
200	0.00008

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.5	0.50001	0.5000	0.0000	0.00013	2.09
1	1.00002	1.0000	0.0000	0.00013	2.09
2	2.00001	2.0000	0.0000	0.00013	2.09
5	5.00002	4.9999	-0.0001	0.00013	2.08
10	10.00001	9.9999	-0.0001	0.00013	2.08
20	20.00002	19.9998	-0.0002	0.00013	2.07
50	50.00001	49.9995	-0.0005	0.00015	2.05
100	100.00006	99.9993	-0.0008	0.00019	2.02
120	120.00008	119.9992	-0.0009	0.00022	2.01
150	150.00007	149.9988	-0.0013	0.00025	2.01
200	199.99991	199.9982	-0.0017	0.00030	2.00

After Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

			Nominal Test Value		100	(g)
Reference Points (g)						
A	B	C	D	E		
-	0.0001	0.0000	-0.0001	0.0001		

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
20	0.00005
200	0.00007

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

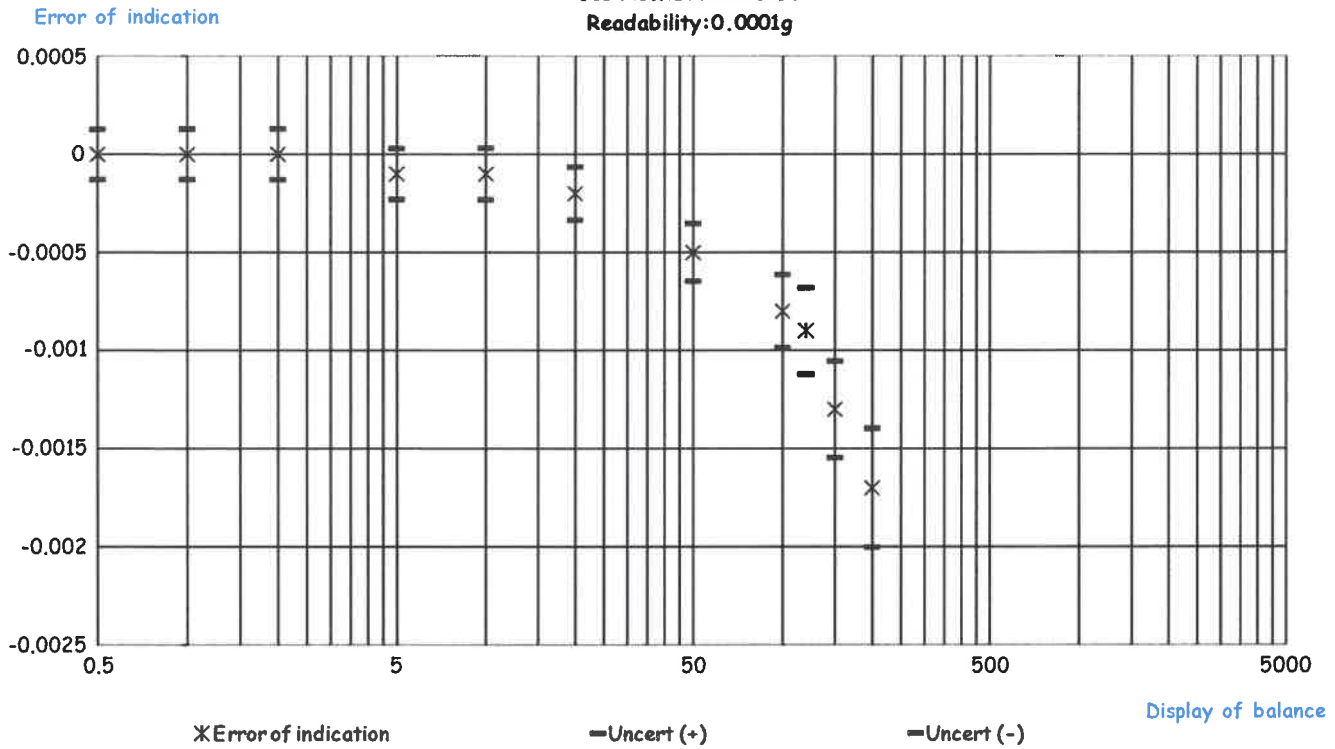
Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.5	0.50001	0.5000	0.0000	0.00012	2.07
1	1.00002	1.0000	0.0000	0.00012	2.07
2	2.00001	2.0000	0.0000	0.00012	2.07
5	5.00002	5.0000	0.0000	0.00012	2.06
10	10.00001	10.0000	0.0000	0.00012	2.06
20	20.00002	20.0000	0.0000	0.00013	2.05
50	50.00001	50.0000	0.0000	0.00014	2.03
100	100.00006	100.0001	0.0000	0.00018	2.01
120	120.00008	120.0002	0.0001	0.00021	2.01
150	150.00007	150.0002	0.0001	0.00024	2.00
200	199.99991	200.0000	0.0001	0.00030	2.00

The End of Certificate

Before Adjustment

Job No. KSPR2215298

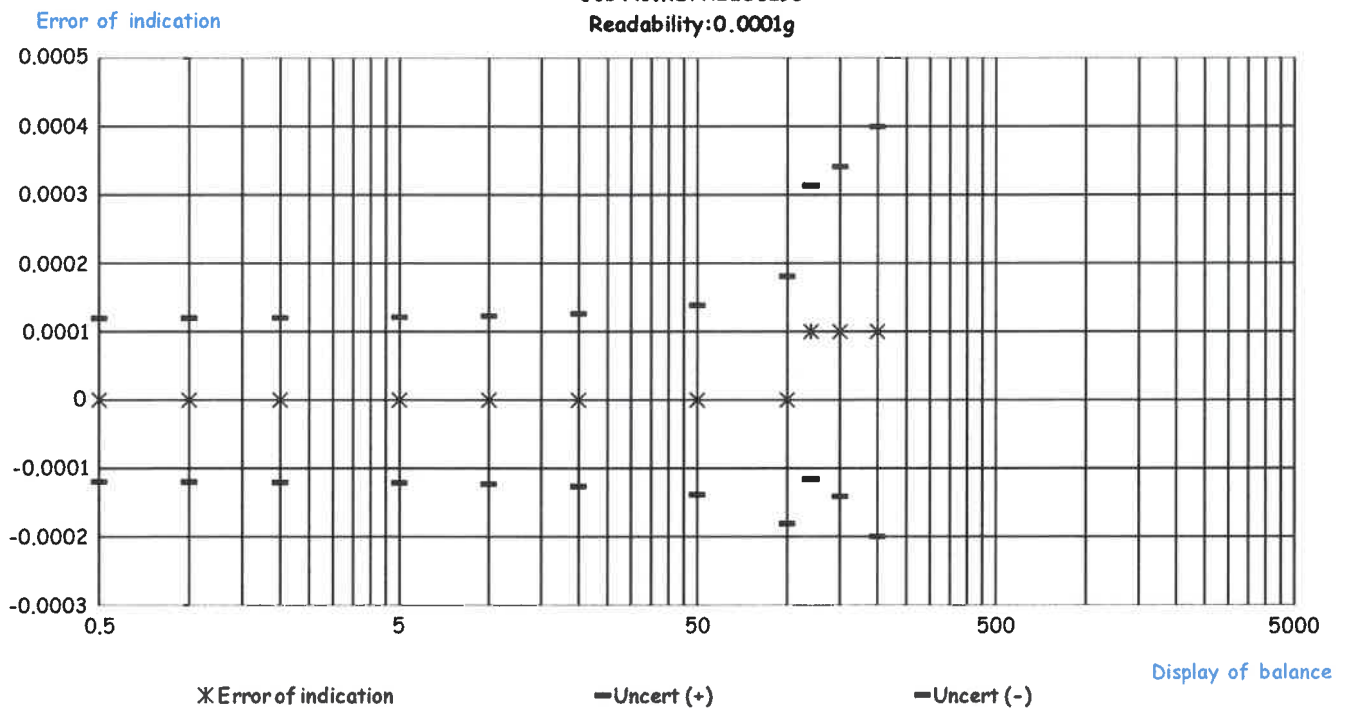
Readability: 0.0001g



After Adjust

Job No. KSPR2215298

Readability: 0.0001g



ใบตรวจสอบสภาพเครื่องชั่ง

เลขที่ใบงาน: KSPR2215298

ชนิดเครื่องมือ: Balance

รุ่น: PA214

หมายเลขเครื่อง: B416510537

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
09 Dec 2022			09 Dec 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดกระจกกันลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. ความสมบูรณ์ชุดของระดับน้ำ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของขาตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การตอบสนองของปุ่มกด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การแสดงผลของ Display หลังวางน้ำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองจานชั่ง (Stopper) / pan support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของตัวเครื่องภายนอกและแกน load cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติม/ข้อแนะนำ :

Mr. Atachai Ngamchanat

Service Engineer



Certificate of Calibration

Equipment:	Hot Air Oven	Certificate No.:	C31221187
Model:	UF 55	Issued Date:	18 June 2022
Serial No.(or ID):	B215.0024(HO-02)	Job No.:	KSPR2207300
Manufacturer:	Memmert	Page:	1 of 4
Condition:	In Condition	Ventilation Valve:	Closed
Shelves(pc.):	1		

Customer: ECO CONSULTANT COMPANY LIMITED.
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Environment Condition:

Temperature:	25 °C	±	0.9 °C
Humidity:	59 %RH	±	3.7 %RH
Voltage:	223 VAC	±	3.6 VAC


Calibration Place: ECO CONSULTANT COMPANY LIMITED. (ห้องปฏิบัติการวิเคราะห์ ชั้น 2)
32/3-4 Moo 4, Tambon Taykoa,
Amphur Samkok, Pathumthani 12160 Thailand

Calibration By: Mr. Ampol Srisumphan

Calibration Date: 17 June 2022


The Method used: In house method, SPCC-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C10220004


(Mr. Ampol Srisumphan)

Person in charge


บริษัท เอสพีซี อาร์ที จำกัด
SPC RT Co., Ltd.

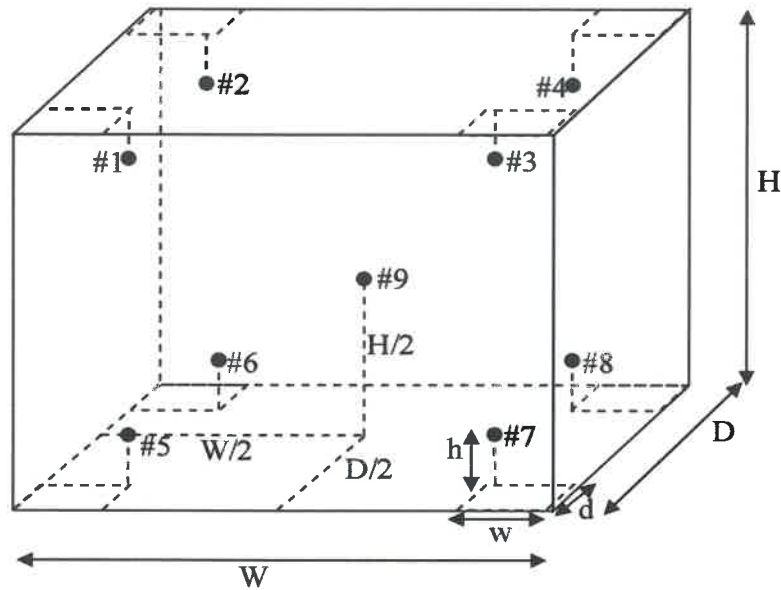

(Mr. Udon Srichana)

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 SPC RT Co., Ltd.



Standard Installation Locations

Volume (Calibration Zone)= 21 (Liters)

Inside chamber: W = 40 (cm) D = 33 (cm) H = 40 (cm)

Standard Locations (#1, #2, #3, #4): w = 5 (cm) d = 5 (cm) h = 5 (cm)

Standard Locations (#5, #6, #7, #8): w = 5 (cm) d = 5 (cm) h = 5 (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	1	2	3	4	5	6	7	8	9

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

Measured Temperature: The average reading of standards at any positions or location.

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

Certificate No.: C31221187

Page: 3 of 4

Calibration Results:

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	104.13	0.13	0.52
#2	104.12	0.12	0.52
#3	104.45	0.45	0.51
#4	104.22	0.22	0.49
#5	103.87	-0.13	0.56
#6	103.61	-0.39	0.53
#7	103.78	-0.22	0.59
#8	103.73	-0.27	0.51
#9	104.27	0.27	0.51

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.0	104.0	104.13	104.12	104.45	104.22	103.87	103.61	103.78	103.73	104.27	0.59

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.72	0.41	1.51

Note: * Maximum uncertainty of the each position

Certificate No.: C31221187

Page: 4 of 4

Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	180.33	0.33	0.52
#2	179.99	-0.01	0.52
#3	180.88	0.88	0.52
#4	180.17	0.17	0.52
#5	179.92	-0.08	0.52
#6	179.29	-0.71	0.52
#7	178.75	-1.25	0.55
#8	179.40	-0.60	0.52
#9	180.35	0.35	0.52

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
180.0	180.0	180.0	180.33	179.99	180.88	180.17	179.92	179.29	178.75	179.40	180.35	0.55

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	1.79	0.17	2.37

Note: * Maximum uncertainty of the each position

The End of Certificate

Certificate No.: C31221187 Page: 1 of 2

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :**
- ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA
 - ☒ Choice B Non-binary statement with guard band ($w = 1 U$), Specific Risk < 2.5% PFA
 - ☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r U$) .
; PFA – Probability of False Accept



(Mr. Udon Srichana)
Authorized signatory

Without adjustment

Desired Temperature : 104.0°C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured (°C)	Correction of UUC. (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	104.13	0.13	0.52	1.0	Pass
#2	104.12	0.12	0.52	1.0	Pass
#3	104.45	0.45	0.51	1.0	Pass
#4	104.22	0.22	0.49	1.0	Pass
#5	103.87	-0.13	0.56	1.0	Pass
#6	103.61	-0.39	0.53	1.0	Pass
#7	103.78	-0.22	0.59	1.0	Pass
#8	103.73	-0.27	0.51	1.0	Pass
#9	104.27	0.27	0.51	1.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

Certificate No.: C31221187 Page: 2 of 2

Statements of conformity:(Cont.)**Without adjustment (Cont.)**

Desired Temperature : 180.0°C Tolerances : 2.0 °C

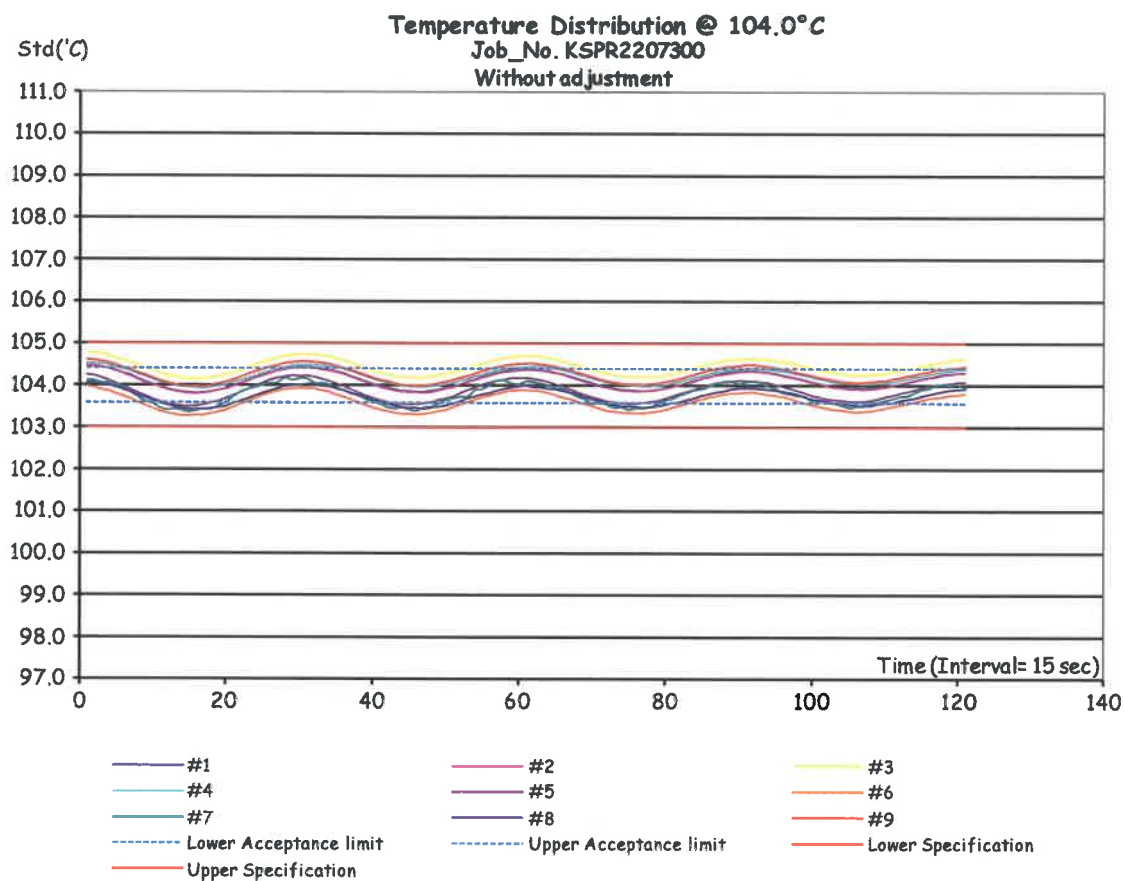
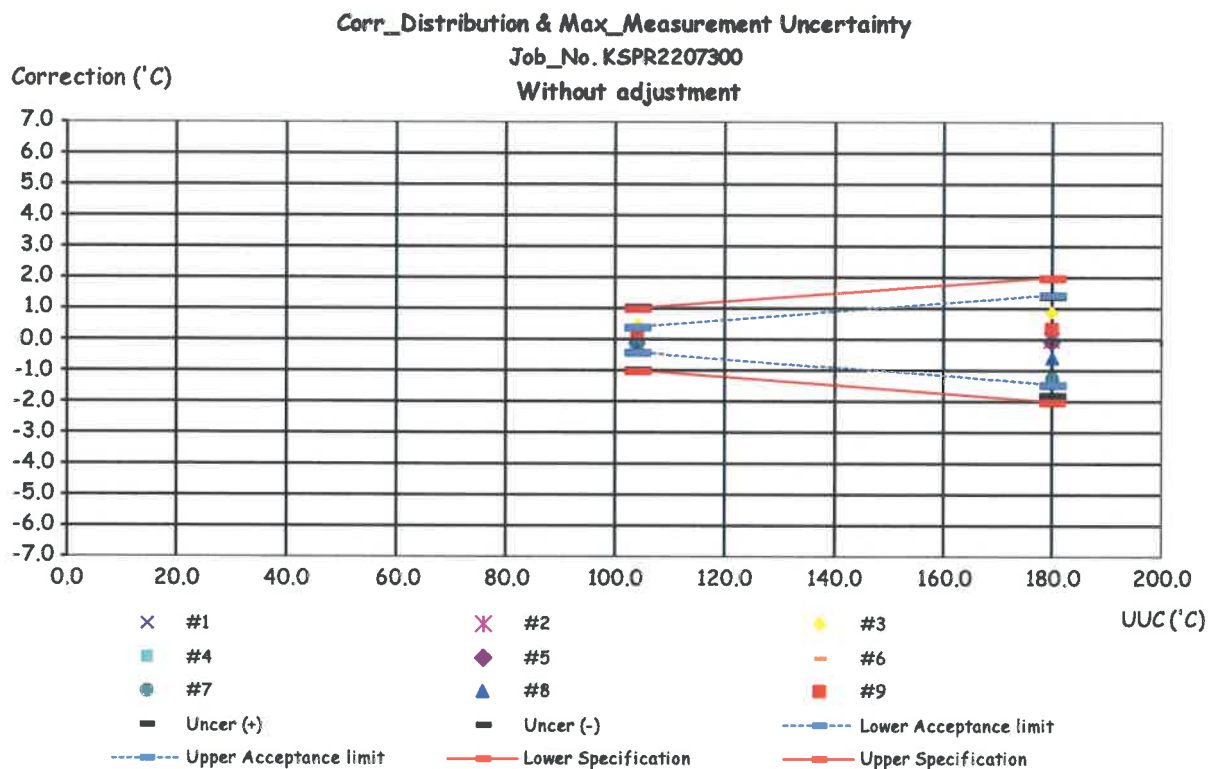
Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured (°C)	Correction of UUC.* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	180.33	0.33	0.52	2.0	Pass
#2	179.99	-0.01	0.52	2.0	Pass
#3	180.88	0.88	0.52	2.0	Pass
#4	180.17	0.17	0.52	2.0	Pass
#5	179.92	-0.08	0.52	2.0	Pass
#6	179.29	-0.71	0.52	2.0	Pass
#7	178.75	-1.25	0.55	2.0	Pass
#8	179.40	-0.60	0.52	2.0	Pass
#9	180.35	0.35	0.52	2.0	Pass

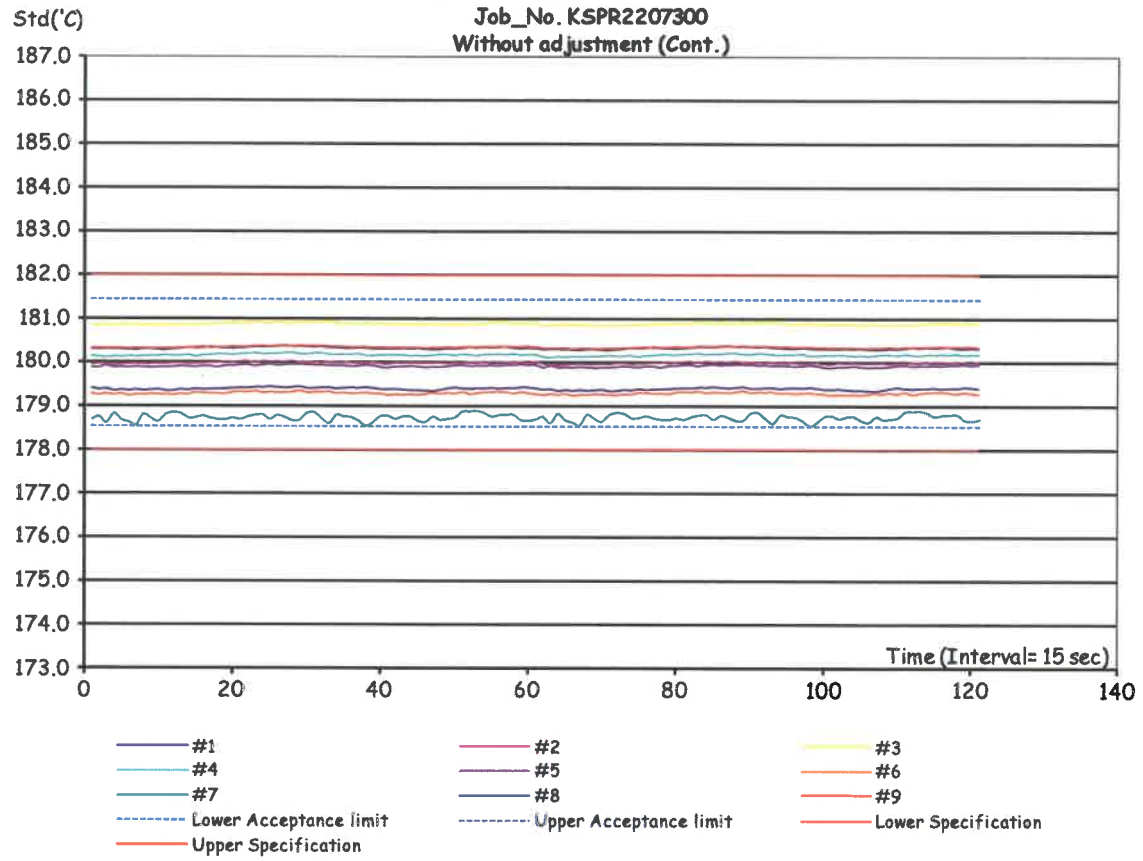
Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of Conformity



Temperature Distribution @ 180.0°C
Job_No. KSPR2207300
Without adjustment (Cont.)



ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2207300

ชนิดเครื่องมือ: Hot Air Oven

รุ่น: UF 55

หมายเลขเครื่อง: B215.0024(HO-02)

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
17 Jun 2022			17 Jun 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความชื้น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Ampol Srisumphan

Service Engineer

CERTIFICATE OF CALIBRATION

Customer: ECO CONSULTANT COMPANY LIMITED
32/3-4, Moo.4, Toi koh, Sam kok,
Pathumthani 12160

Manufacturer: Hanon

Model Number: SH420F

Description: Graphite Digester

Asset Number: SH526220249

Serial #: SH526220249

P.O. #: N/A

Procedure: CPTD-05 (Sep, 2020)

Certificate Number: TTH-58350

Temperature: 25 °C

Relative Humidity: 56 %RH

Calibration Location: On-Site

Calibrated By: GAKKAPONG KONGKAMUD

Calibration Date: 22/Sep/2022

Next Due Date: 22/Sep/2023

Condition Received: IN TOLERANCE

Condition Returned: IN TOLERANCE

This certifies that the above instrument was calibrated in compliance with the Calibration System Requirements of ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 (R2002) in accordance with referenced procedures. Standards used to perform this calibration are traceable to SI units; their source of traceability derives from a National Metrology Institute such as NIST, CENAM, NPL, DIN, from natural physical constants, consensus standards or derived by the ratio type of calibrations. Collective uncertainties are determined as required with a distribution that corresponds to a probability of approximately 95% (k=2). Unless otherwise noted calibrations are performed to manufacturer's specifications. Compliance statements are in conformance with ILAC-G8:2019 simple acceptance decision rule. This form shall not be reproduced, except in full, without the expressed written consent of Techmaster. Contact our customer service representative for clarification of this document.

Standards Utilized

Standard #	Description	Manufacturer	Model #	Due Date	Test Report #
5680	Digital Multimeter	Hewlett Packard	3458A	09/Mar/2023	TTH-0-54073-R6
5755	Standard PRTs	FLUKE	5626	29/Jul/2023	TTH-0-57476

Remarks:

W. Chootian

Wannipa Chootian
Quality Assurance

P. Moonmuangsan

Pornthep Moonmuangsan
Technical Manager

N. Hemta

Nopparat Homta
Approved By

Issued on: 2022-09-28 20:16:31.9500000 -07:00

TTH-58350



540.1 2105

Page 1 of 2

Calibration Results



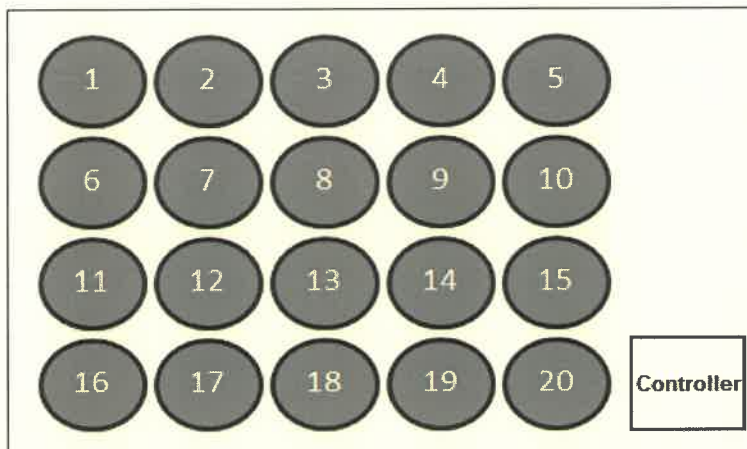
Manufacturer: Hanon
Description: Graphite Digester

Asset No. SH526220249
Serial No. SH526220249

Model # : SH420F

Report No. TTH-58350

Furnace Hole



Temperature Accuracy

Furnace Hole	UUT Displayed	Measured Value				Uncertainty	Tolerance	
		Resistance	Actual Value	Error	Result		Min	Max
1	380.0 °C	241.4682 Ω	379.54 °C	0.46 °C	Pass	0.30 °C	379.00 °C	381.00 °C
2	380.0 °C	241.4839 Ω	379.59 °C	0.41 °C	Pass	0.30 °C	379.00 °C	381.00 °C
3	380.0 °C	241.4280 Ω	379.43 °C	0.57 °C	Pass	0.30 °C	379.00 °C	381.00 °C
4	380.0 °C	241.4145 Ω	379.39 °C	0.61 °C	Pass	0.30 °C	379.00 °C	381.00 °C
5	380.0 °C	241.4737 Ω	379.56 °C	0.44 °C	Pass	0.30 °C	379.00 °C	381.00 °C
6	380.0 °C	241.4305 Ω	379.44 °C	0.56 °C	Pass	0.30 °C	379.00 °C	381.00 °C
7	380.0 °C	241.4365 Ω	379.45 °C	0.55 °C	Pass	0.30 °C	379.00 °C	381.00 °C
8	380.0 °C	241.4084 Ω	379.37 °C	0.63 °C	Pass	0.30 °C	379.00 °C	381.00 °C
9	380.0 °C	241.4041 Ω	379.36 °C	0.64 °C	Pass	0.30 °C	379.00 °C	381.00 °C
10	380.0 °C	241.4663 Ω	379.54 °C	0.46 °C	Pass	0.30 °C	379.00 °C	381.00 °C
11	380.0 °C	241.4313 Ω	379.44 °C	0.56 °C	Pass	0.30 °C	379.00 °C	381.00 °C
12	380.0 °C	241.5030 Ω	379.64 °C	0.36 °C	Pass	0.30 °C	379.00 °C	381.00 °C
13	380.0 °C	241.4577 Ω	379.51 °C	0.49 °C	Pass	0.30 °C	379.00 °C	381.00 °C
14	380.0 °C	241.6011 Ω	379.92 °C	0.08 °C	Pass	0.30 °C	379.00 °C	381.00 °C
15	380.0 °C	241.4752 Ω	379.56 °C	0.44 °C	Pass	0.30 °C	379.00 °C	381.00 °C
16	380.0 °C	241.5588 Ω	379.80 °C	0.20 °C	Pass	0.30 °C	379.00 °C	381.00 °C
17	380.0 °C	241.3959 Ω	379.34 °C	0.66 °C	Pass	0.30 °C	379.00 °C	381.00 °C
18	380.0 °C	241.4577 Ω	379.51 °C	0.49 °C	Pass	0.30 °C	379.00 °C	381.00 °C
19	380.0 °C	241.4482 Ω	379.49 °C	0.51 °C	Pass	0.30 °C	379.00 °C	381.00 °C
20	380.0 °C	241.4709 Ω	379.55 °C	0.45 °C	Pass	0.30 °C	379.00 °C	381.00 °C

Notes : - The calibration results are verified its tolerance with the manufacturer's specification.

- The instrument was calibrated for the parameter and at the points specified by the customer.

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TTH-58350



540.6 1503

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