

เอกสารแนบ จ  
เอกสารสอบเทียบเครื่องมือ

---

บริษัท อินทิเกรตเต็ด รีเสิร์ช เซ็นเตอร์ จำกัด



## Certificate of Calibration

Equipment: Digital Thermometer with Probe  
 Model: SevenEasy  
 Serial No.(or ID): 1232025225  
 Manufacturer: Mettler Toledo  
 Condition: In Condition


Certificate No.: C15220570  
 Issued Date: 21 November 2022  
 Job No.: KSPR2214833  
 Page: 1 of 2

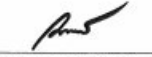
Customer: Integrated Research Center Co.,Ltd.  
 122 Moo 2, Tambol Thatoom,  
 Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature: 22 °C ± 3.0 °C  
 Humidity: 50 %RH ± 15.0 %RH  
 Voltage: 230 VAC ± 10.0 %VAC

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

Calibration By: Mr. Tiewewong Thaitiang  
 Calibration Date: 21 November 2022  
 The Method used: In house method, CAL-WI-19, by comparison with standard thermometer  
 Traceability: This certificate is traceable to the SI Units maintained by Thailand through  
 TISTR Certificate No. PSL-T 0052/85

  
 (Mr. Tiewewong Thaitiang)  
 Person in charge

  
 (Mr. Pramote Ramrong)  
 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 laboratory.  
 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.  
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CAL-FM-C15-13: 12 Sep 2022

## Calibration Results:

## Without Adjustment

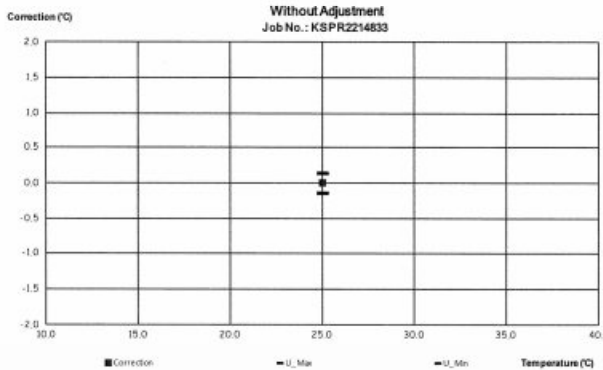
Sensor Type: RTD		Channel: -	
Diameter (mm): 15	Length (mm): 120	Immersion (mm): 110	
Desired Temp.(°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)
25.0	25.003	25.0	0.003
			Uncertainty (± °C)
			0.14

The End of Certificate

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## ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ

เลขที่ใบงาน: KSPR2214833

ชนิดเครื่องมือ: Digital Thermometer with Probe  
 หมายเลขเครื่อง: 1232025225

รุ่น: SevenEasy

ตรวจสอบ (วัน)		ตรวจสอบ (ค่า)		หมายเหตุ
ปกติ	ไม่ปกติ	ปกติ	ไม่ปกติ	
รายการตรวจเช็ค		General		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. Battery	<input checked="" type="checkbox"/>	adapter
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Sensor ( In / Ex )	<input checked="" type="checkbox"/>	

ขอแนะนำ :

Mr. Tiewewong Thaitiang  
 Service Engineer

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# Certificate of Calibration

Certificate No.: C15220569

Page: 2 of 2

Equipment: Digital Thermometer with Probe  
Model: Seven2Go  
Serial No.(or ID): B633886757  
Manufacturer: Mettler Toledo  
Condition: In Condition

Certificate No.: C15220569  
Issued Date: 21 November 2022  
Job No.: KSPR2214832  
Page: 1 of 2

Customer: Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature: 22 °C ± 3.0 °C  
Humidity: 50 %RH ± 15.0 %RH  
Voltage: 230 VAC ± 10.0 %VAC

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

Calibration By: Mr. Tweewong Thaihiang  
Calibration Date: 21 November 2022  
The Method used: In house method, CAL-WI-19, by comparison with standard thermometer  
Traceability: This certificate is traceable to the SI Units maintained by Thailand through  
TISTR Certificate No. PSL-T 0052/85

## Calibration Results:

### Without Adjustment

Sensor Type: RTD		Channel: -	
Diameter (mm) 15	Length (mm): 120	Immersion (mm): 110	
Desired Temp.(°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)
25.0	25.007	25.0	0.007
			0.14

The End of Certificate

(Mr. Tweewong Thaihiang)

(Mr. Pramote Ramrong)

Person in charge  
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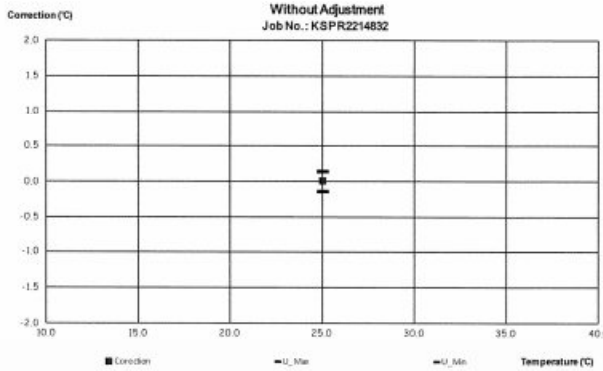
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## ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ

เลขที่ใบงาน: KSPR2214832

ชนิดเครื่องมือ: Digital Thermometer with Probe  
หมายเลขเครื่องมือ: B633886757

รุ่น: Seven2Go

ตรวจสอบ (วัน)		รายการตรวจสอบ		ตรวจสอบ (ส่ง)	หมายเหตุ
ปกติ	ไม่ปกติ			ปกติ	
		General			
<input type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ		<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch		<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. Battery		<input checked="" type="checkbox"/>	75%
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพตัวเครื่อง		<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Sensor ( In / Ex )		<input checked="" type="checkbox"/>	

ลงนาม:

Mr. Tweewong Thaihiang  
Service Engineer

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# Certificate of Calibration

**Equipment:** Balance  
**Model:** BSA224S-CW  
**Serial No. (or ID.):** 34490341  
**Manufacturer:** Sartorius  
**Condition:** In condition

**Certificate No.:** C01223378  
**Issued Date:** 05 November 2022  
**Job No.:** KSPR2213519  
**Page:** 1 of 2

**Customer:** Double A (1991) Public Company Limited,  
 1 Moo 2, Thathom, Srimahaphot,  
 Prachinburi 25140 Thailand.

**Environment Condition:** Temperature 24 °C ± 0.5 °C  
 Humidity 50 %RH ± 3.4 %RH

**Calibration Place:** Double A (1991) Public Company Limited, (วัดเขารัตนบุรี)  
 1 Moo 2, Thathom, Srimahaphot,  
 Prachinburi 25140 Thailand.

**Calibration By:** Mr. Piypat Saidoung  
**Calibration Date:** 31 October 2022  
**The Method used:** In-house method, CAL-W-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. C02221862

*Signature*  
 (Mr. Piypat Saidoung)  
 Person in charge

*Signature*  
 (Mr. Rungrat Jenkitrakulchai)  
 Authorized signatory

This certificate is issued for the use of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
 The measurement uncertainty stated in the 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).  
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CAL-FM-C01-14: 12 Sep 2022

Certificate No.: C01223378

Page: 2 of 2

## Calibration Results: Without 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		Reference Points (g)				
		A	B	C	D	E
100 (g)		0.0000	0.0000	0.0000	-0.0001	0.0000

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

Nominal test value (g)	Standard Deviation
20	0.00004
200	0.00007

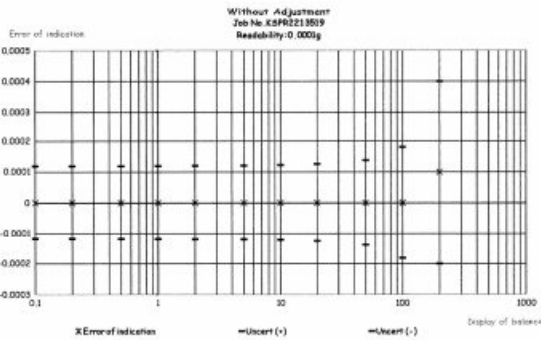
**Error of Indication from nominal or conventional mass value. Readability 0.0001 (g)**

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
0.1	0.10000	0.1000	0.0000	0.00012	2.07
0.2	0.20000	0.2000	0.0000	0.00012	2.07
0.5	0.50000	0.5000	0.0000	0.00012	2.07
1	1.00001	1.0000	0.0000	0.00012	2.07
2	2.00002	2.0000	0.0000	0.00012	2.07
5	5.00003	5.0000	0.0000	0.00012	2.06
10	10.00002	10.0000	0.0000	0.00012	2.06
20	20.00000	20.0000	0.0000	0.00013	2.05
50	50.00000	50.0000	0.0000	0.00014	2.03
100	100.00004	100.0000	0.0000	0.00018	2.01
200	200.00004	200.0001	0.0001	0.00030	2.00

The End of Certificate

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CAL-FM-C01-14: 12 Sep 2022



## ใบตรวจสอบสภาพเครื่องชั่ง

เลขที่ใบงาน: KSPR2213519  
 ชนิดเครื่องชั่ง: Balance รุ่น: BSA224S-CW หมายเลขเครื่อง: 34490341

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
31 Oct 2022			31 Oct 2022		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
General					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220V/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ของกล่องกันลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. ความสมบูรณ์ของระดับน้ำ	<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. การเชื่อมต่อของถังพัก	<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. การเชื่อมต่อของ Display หน้าจอนำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ขารองจานชั่ง (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. ความสะอาดของผิวสัมผัสภายในและภายนอก 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"/>	

หมายเหตุเพิ่มเติมเกี่ยวกับเครื่อง:

Mr. Piypat Saidoung  
 Service Engineer

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## Certificate of Calibration

### Calibration Results:

Certificate No.: C02222286

Page 2 of 2

Equipment: Standard Weight  
Model: 1 g  
Serial No. (or ID.): Weight 001  
Manufacturer: LS  
Condition: In condition

Certificate No.: C02222286  
Issued Date: 3 November 2022  
Job No.: KSPR2213528  
Page: 1 of 2  
Class: -

Nominal Value	Marking	Conventional Mass	Uncertainty ( $\pm$ mg)	MPE Class ( $\pm$ mg)
1 g	None	1 g + 0.044 mg	0.030	0.10 F1

Note: These MPE Class are only conventional mass.

The End of Certificate

Customer: Integrated Research Center Co., Ltd. (Pulp Laboratory)  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 22 °C  $\pm$  2 °C  
Relative Humidity 50 %RH  $\pm$  10 %RH  
Atmospheric Pressure 980-1030 mbar

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

Calibration By: Mr. Anusom Jitborikhon  
Calibration Date: 03 November 2022  
The Method used: In house method, CAL-WI-48, base on OIML R111-1  
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (Thailand), NIMT through DKSH Technology Limited. Certificate No. C02222184.

(Mr. Anusom Jitborikhon)  
Person in charge

(Mr. Runrod 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.  
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CAL-FM-C02-12: 12 Sep 2022



## Certificate of Calibration

### Calibration Results:

Certificate No.: C02222287

Page 2 of 2

Equipment: Standard Weight  
Model: 100 g  
Serial No. (or ID.): Weight 002  
Manufacturer: LS  
Condition: In condition

Certificate No.: C02222287  
Issued Date: 3 November 2022  
Job No.: KSPR2213529  
Page: 1 of 2  
Class: -

Nominal Value	Marking	Conventional Mass	Uncertainty ( $\pm$ mg)	MPE Class ( $\pm$ mg)
100 g	None	100 g - 0.06 mg	0.16	0.5 F1

Note: These MPE Class are only conventional mass.

The End of Certificate

Customer: Integrated Research Center Co., Ltd. (Pulp Laboratory)  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 22 °C  $\pm$  2 °C  
Relative Humidity 50 %RH  $\pm$  10 %RH  
Atmospheric Pressure 980-1030 mbar

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

Calibration By: Mr. Anusom Jitborikhon  
Calibration Date: 03 November 2022  
The Method used: In house method, CAL-WI-48, base on OIML R111-1  
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (Thailand), NIMT through DKSH Technology Limited. Certificate No. C02222184.

(Mr. Anusom Jitborikhon)  
Person in charge

(Mr. Runrod Jenkitrakulchai)  
Authorized signatory

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CAL-FM-C02-12: 12 Sep 2022



## Certificate of Calibration

Certificate No.: C02222288

Page 2 of 2

### Calibration Results:

Nominal Value	Marking	Conventional Mass	Uncertainty ( $\pm$ mg)	MPE Class ( $\pm$ mg)
200 g	None	200 g - 0.46 mg	0.30	1.0 F1

Note: These MPE Class are only conventional mass.

### The End of Certificate

Equipment: Standard Weight  
Model: 200 g  
Serial No. (or ID.): Weight 003  
Manufacturer: LS  
Condition: In condition

Certificate No.: C02222288  
Issued Date: 3 November 2022  
Job No.: KSPR2213530  
Page: 1 of 2  
Class: -

Customer: Integrated Research Center Co., Ltd. (Pulp Laboratory)  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature 22 °C  $\pm$  2 °C  
Relative Humidity 50 %RH  $\pm$  10 %RH  
Atmospheric Pressure 980-1030 mbar

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

Calibration By: Mr. Anusorn Jitborikhon  
Calibration Date: 03 November 2022  
The Method used: In house method, CAL-WI-48, base on OIML R111-1  
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (Thailand), NIMT through DKSH Technology Limited. Certificate No. C02222184.

(Mr. Anusorn Jitborikhon)  
Person in charge

(Mr. Runrod Jenkitrakulchai)  
Authorized signatory

This certificate is issued in the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
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Unit: Bureau of Standards and Technology  
DKSH Technology Limited  
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## Certificate of Calibration

Certificate No.: C07220556

Page 2 of 3

### Calibration Results:

#### pH Scale

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

Equipment: pH METER  
Model: SevenEasy  
Serial No. (or ID.): 123025225  
Manufacturer: Mettler Toledo  
Electrode Serial No.: 1220653  
Condition: In Condition

Certificate No.: C07220556  
Issued Date: 5 November 2022  
Job No.: KSPR2213521  
Page: 1 of 3  
Model: 405-60-T-PA-SB120 pH Brand: Mettler Toledo

Customer: Double A (1991) Public Company Limited.  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

Environment Condition: Temperature 28.0 °C  $\pm$  0.2 °C  
Humidity 55.4 %RH  $\pm$  2.2 %RH

Calibration Place: Double A (1991) Public Company Limited. (Environmental Laboratory 01)  
1 Moo 2, Thatoom, Srimahaphot,  
Prachinburi 25140 Thailand.

Calibration By: Mr. Piyaat Saisong  
Calibration Date: 1 November 2022  
The Method used: In house method, CAL-WI-58, base on ASTM E 70-07  
Traceability: This certificate is traceable to SI Units. Sample Test is assured through primary measurement method Harned cell, through CPAchem Ltd. (ISO/IEC 17034) Certificate No. 794132, 794134, 794133 And pH Scale traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Industrial Foundation Electrical and Electronics Institute Certificate No. CA2022054EA

(Mr. Piyaat Saisong)  
Person in charge

(Mr. Thaimongkeat Pongngam)  
Authorized signatory

This certificate is issued in the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated in the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ( $k=2$ ) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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CAL-FM-C07-13: 12 Sep 2022

Unit: Bureau of Standards and Technology  
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## ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2213521

## Electrode Test Results\*

The three-point calibration using three standard buffer solutions; pH 4.008, pH 6.885 and pH 10.015

-During calibration, display of pH meter reading; pH 4.00, pH 7.00 and pH 10.01

The practical slope of the pH electrode; 58.40 (mV/pH), 98.72%

The zero point of the pH electrode; 6.91 (pH)

## Sample Test Results

Standard Buffer Solution (pH)	Unit Under Calibration (pH)	Difference (pH)	Uncertainty of Measurement (pH)	Coverage Factor (k)
4.008	4.00	-0.008	0.0072	2.00
6.885	7.00	0.015	0.0097	2.00
10.015	10.01	-0.005	0.013	2.00

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

The End of Certificate

ชนิดเครื่องมือ: pH METER		รุ่น: SevenEasy	หมายเลขเครื่อง: 1232025225
ตรวจโดย (ปี)		ตรวจด้วย (ปี)	
01 Nov 2022		01 Nov 2022	
รายการตรวจเช็ค		หมายเหตุ	
ปกติ	ไม่ปกติ	ปกติ	ไม่ปกติ
<b>General</b>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายในหม้อเครื่อง)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ เปิด - ปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>
<b>Specialty Instrument</b>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. แบตเตอรี่สำรอง (Battery Backup) >= 2.5 VDC	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. ตัวควบคุมความยาวคลื่น (Wavelength Control)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. แสงอัลตราไวโอเลต (UV < 3,000 hour)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แสงที่มองเห็น (Visible < 5,000 hour)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. ชุดวัดความเข้มข้น (Carousel Module)	<input checked="" type="checkbox"/>
<b>pH Meter and Conductivity Meter</b>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. อินдикเตอร์ (Electrode and Connection Cable)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดป้องกัน Electrode (Dust Protection Hood)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งอินдикเตอร์ (Stand)	<input checked="" type="checkbox"/>
<b>Turbidimeter</b>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	17. หน้การแสดงผลหน้าจอ (>= 2.5 นิ้ว ถึง 3.0)	<input checked="" type="checkbox"/>
<b>Automatic titrator</b>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	20. ระบบละลายยาและอุณหภูมิละลาย	<input checked="" type="checkbox"/>

เงื่อนไขข้อแนะนำ: Electrode ที่อุณหภูมิ 24.9 °C ใน Control Waterbath ที่ 25.0 ±0.5°C

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CAL-FM-C07-13: 12 Sep 2022

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CAL-FM-R1-03: 30 Jul 2022

## Certificate of Calibration

**Equipment:** pH METER  
Model: SevenGo S2  
Serial No. (or ID.): 863386757  
Manufacturer: Mettler Toledo  
Electrode Serial No.: 1364078  
Condition: In Condition

**Customer:** Double A (1991) Public Company Limited.  
1 Moo 2, Thathom, Srirachaphot,  
Prachinburi 25140 Thailand.

**Environment Condition:** Temperature 28.0 °C ± 0.2 °C  
Humidity 55.4 %RH ± 2.2 %RH

**Calibration Place:** Double A (1991) Public Company Limited. (Environmental Laboratory 01)  
1 Moo 2, Thathom, Srirachaphot,  
Prachinburi 25140 Thailand.

**Calibration By:** Mr.Piyapat Saidoung  
**Calibration Date:** 1 November 2022  
**The Method used:** In house method, CAL-WI-08, base on ASTM E 70-07  
**Traceability:** This certificate is traceable to SI Units. Sample Test is assured through primary measurement method Harned cell, through CPAchem Ltd. (ISO/IEC 17034) Certificate No. 794132, 794134, 794133 And pH Scale traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Industrial Foundation Electrical and Electronics Institute Certificate No. CA0220054EA

(Mr. Piyapat Saidoung)  
Person in charge(Mr. Thakongkiet Pongngam)  
Authorized signatory

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

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

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

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CAL-FM-C07-13: 12 Sep 2022

## Calibration Results:

## pH Scale

Input	pH Meter Reading				Uncertainty of Measurement (mV)	Coverage Factor (k)
	(mV)	(mV)	Error (mV)	(pH)		
414.12	414	-0.12	0.02	0.58	2.00	
354.96	355	0.04	1.02	0.58	2.00	
295.8	295	-0.80	2.02	0.58	2.00	
236.64	236	-0.64	3.02	0.58	2.00	
177.48	177	-0.48	4.01	0.58	2.00	
118.32	118	-0.32	5.01	0.58	2.00	
59.16	60	0.84	6.00	0.58	2.00	
0	0	0.00	7.00	0.58	2.00	
-59.16	-59	0.16	8.00	0.58	2.00	
-118.32	-118	0.32	8.99	0.58	2.00	
-177.48	-177	0.48	9.99	0.58	2.00	
-236.64	-236	0.64	10.98	0.58	2.00	
-295.8	-295	0.80	11.98	0.58	2.00	
-354.96	-355	-0.04	12.98	0.58	2.00	
-414.12	-414	0.12	13.98	0.58	2.00	

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CAL-FM-C07-13: 12 Sep 2022



**Electrode Test Results\***

The three-point calibration using three standard buffer solutions: pH 4.008, pH 6.985 and pH 10.015  
 -During calibration, display of pH meter reading: pH 4.01, pH 7.00 and pH 10.01  
 The practical slope of the pH electrode: 58.83 (mV/pH), 99.45%  
 The zero point of the pH electrode: 7.00 (pH)

**Sample Test Results**

Standard Buffer Solution (pH)	Unit Under Calibration (pH)	Difference (pH)	Uncertainty of Measurement (pH)	Coverage Factor (k)
4.008	4.01	0.002	0.0072	2.00
6.985	7.00	0.015	0.0097	2.00
10.015	10.01	-0.005	0.013	2.00

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

The End of Certificate

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CAL-FM-C07-13: 12 Sep 2022

ชนิดเครื่องมือ: pH METER		รุ่น: Seven2Go S2	หมายเลขเครื่อง: B633886757
การสอบ (ปี)		ผลการสอบ (ค่า)	
01 Nov 2022		01 Nov 2022	
ปกติ	ไม่ปกติ	ปกติ	ไม่ปกติ
<b>General</b>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความแม่นยำของ	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความเสถียร (ของค่าเฉลี่ย, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ เปิด - ปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>
<b>Specialty Instrument</b>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. แบตเตอรี่สำรอง (Battery Backup) >= 2.5 VDC	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. ตัวควบคุมความยาวคลื่น (Wavelength Control)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. ขอบเขตเลนส์หมุน (Carousel Module)	<input checked="" type="checkbox"/>
<b>pH Meter and Conductivity Meter</b>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. อินดิเคเตอร์ (Electrode and Connection Cable)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดกันฝุ่น Electrode (Dust Protection Hood)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งอินดิเคเตอร์ (Stand)	<input checked="" type="checkbox"/>
<b>Turbidimeter</b>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นที่ต่ำสุด (No Sample)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	17. ระดับการดูดกลืนแสงของเซลล์ (>= 2.5 ไม่นับ 3.0)	<input checked="" type="checkbox"/>
<b>Automatic Strainer</b>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	18. สลัก Piston Burettes	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	20. ขบวนการทำความสะอาดภายในห้อง	<input checked="" type="checkbox"/>

เพิ่มเติมก่อนหน้า: Electrode ที่อุณหภูมิวัด 25.1 °C โดย Control Waterbath ที่ 25.0 ±0.5°C

Mr.Piyapat Saisoung  
 Service Engineer

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CAL-FM-R31-05: 20 Jul 2022



**Certificate of Calibration**

**Equipment:** Hot Air Oven  
**Model:** UF110  
**Serial No.(or ID):** B417.1014  
**Manufacturer:** Memmert  
**Condition:** In Condition  
**Shelves(pc.):** 2  
**Certificate No.:** C31222116  
**Issued Date:** 07 November 2022  
**Job No.:** KSPR2213984  
**Page:** 1 of 3  
**Ventilation Valve:** Closed

**Customer:** Integrated Research Center Co.,Ltd.  
 122 Moo 2, Tambol Thatoom,  
 Amphur Srimahaphote, Prachinburi 25140 Thailand

**Environment Condition:** Temperature: 29 °C ± 0.3 °C  
 Humidity: 50 %RH ± 4.5 %RH  
 Voltage: 230 VAC ± 3.2 VAC

**Calibration Place:** Integrated Research Center Co.,Ltd.( Environmental Laboratory 02 )  
 122 Moo 2, Tambol Thatoom,  
 Amphur Srimahaphote, Prachinburi 25140 Thailand

**Calibration By:** Mr. Piyapat Saisoung  
**Calibration Date:** 01 November 2022

**The Method used:** In house method, CAL-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. C10220002

(Mr. Piyapat Saisoung)

Person in charge

(Mr. Udon Srichana)

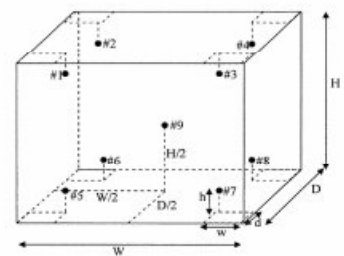
Authorized signatory

This certificate is issued in the unit of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
 The measurement uncertainty stated in the 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).  
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CAL-FM-C31-10: 12 Sep 2022



**Standard Installation Locations**

Volume (Calibration Zone)= 50 (Liters)

Inside chamber: W = 58 (cm) D = 40 (cm) H = 48 (cm)

Standard Locations (#1, #2, #3, #4): w = 6 (cm) d = 5 (cm) h = 5 (cm)

Standard Locations (#5, #6, #7, #8): w = 6 (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.

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CAL-FM-C31-10: 12 Sep 2022

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	104.85	0.85	0.40
#2	104.09	0.09	0.40
#3	104.49	0.49	0.40
#4	104.03	0.03	0.40
#5	103.59	-0.41	0.40
#6	103.64	-0.36	0.40
#7	103.10	-0.90	0.40
#8	103.41	-0.59	0.40
#9	103.84	-0.16	0.40

Temperature Distribution

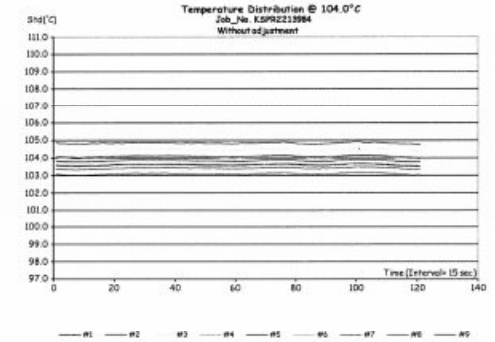
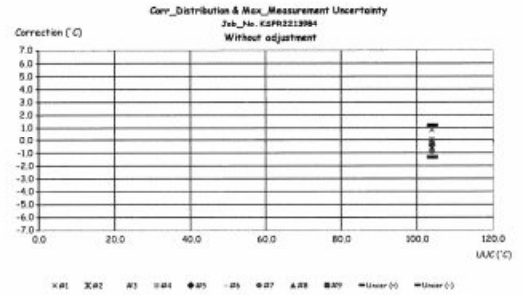
Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)	Uncertainty (± °C)
104.0	104.0	104.0	#1 #2 #3 #4 #5 #6 #7 #8 #9	0.40

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	1.05	0.09	1.90

Note: \* Maximum uncertainty of the each position

The End of Certificate



ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

ชนิดเครื่อง: Hot Air Oven  
หมายเลขเครื่อง: B417.1014

รุ่น: UF110

เลขที่ใบงาน: KSPR2213984

ตรวจสอบ (รับ)	รายการตรวจเช็ค	ตรวจสอบ (ส่ง)	หมายเหตุ
01 Nov 2022		01 Nov 2022	
ปกติ	ปกติ	ปกติ	ปกติ
	General		
<input checked="" type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	5. การทำงาน ฟิวส์	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	6. สลัก Lever of Ventilation valve	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	7. สลัก Lever door open / close	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	8. สลัก Door seal	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	12. สลักเตือนเครื่อง	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	13. สลักเบรกค้อน ณ สถานที่ยกเครื่อง	<input checked="" type="checkbox"/>	

เซ็นเซอร์:

Mr. Piyaat Saidoung  
Service Engineer



Certificate of Calibration

Equipment: Oven  
Model: ED 115  
Serial No.(or ID): 2019000012946  
Manufacturer: Binder  
Condition: In Condition  
Shelves(pc.): 2

Certificate No.: C31222108  
Issued Date: 06 November 2022  
Job No.: KSPR2213983  
Page: 1 of 3  
Ventilation Valve: Closed

Customer: Double A (1991) Public Company Limited.  
1 Moo 2, Thaloem, Srirachaphot,  
Prachinburi 25140 Thailand.

Environment Condition: Temperature: 29 °C ± 0.7 °C  
Humidity: 54 %RH ± 4.2 %RH  
Voltage: 228 VAC ± 3.2 VAC

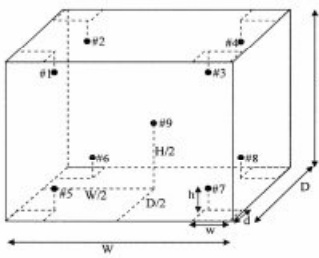
Calibration Place: Double A (1991) Public Company Limited. (Environmental Laboratory 02)  
1 Moo 2, Thaloem, Srirachaphot,  
Prachinburi 25140 Thailand.

Calibration By: Mr. Piyaat Saidoung  
Calibration Date: 01 November 2022  
The Method used: In house method, CAL-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. C10220001

(Mr. Piyaat Saidoung)  
Person in charge

(Mr. Udon Srirachana)  
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.



#### Standard Installation Locations

Volume (Calibration Zone) = 62 (Liters)

Inside chamber: W = 60 (cm) D = 40 (cm) H = 53 (cm)

Standard Locations (#1, #2, #3, #4): w = 6 (cm) d = 5 (cm) h = 5 (cm)

Standard Locations (#5, #6, #7, #8): w = 6 (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.

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DKSH Technology Limited  
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CAL-FM-C31-19: 12 Sep 2022

#### Calibration Results:

##### Pre-Calibration

Setting	Indicating	#1	#2	#3	#4	#5	#6	#7	#8	#9
104	104	102.71	102.66	103.13	103.08	101.80	101.53	101.25	101.12	101.33

##### Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 107 °C

Locations	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
#1	105.52	-1.48	0.80
#2	105.45	-1.55	0.79
#3	105.91	-1.09	0.80
#4	105.86	-1.14	0.79
#5	104.31	-2.69	0.80
#6	104.17	-2.83	0.82
#7	104.04	-2.96	0.81
#8	103.86	-3.14	0.82
#9	104.11	-2.89	0.80

##### Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
104	107	107	105.52	105.45	105.91	105.86	104.31	104.17	104.04	103.86	104.11	0.82

##### Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
107	1.94	0.19	2.29

Note: \* Maximum uncertainty of the each position

The End of Certificate

DKSH Calibration Services (UK) Ltd  
DKSH Technology Limited  
2023 Roadside Industrial Estate, Kluang, Johor Bahru, Malaysia 81000  
2023 Roadside Industrial Estate, Kluang, Johor Bahru, Malaysia 81000  
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#### ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2213963

ชนิดเครื่อง: Oven

รุ่น: ED 115

หมายเลขเครื่อง: 20190000012946

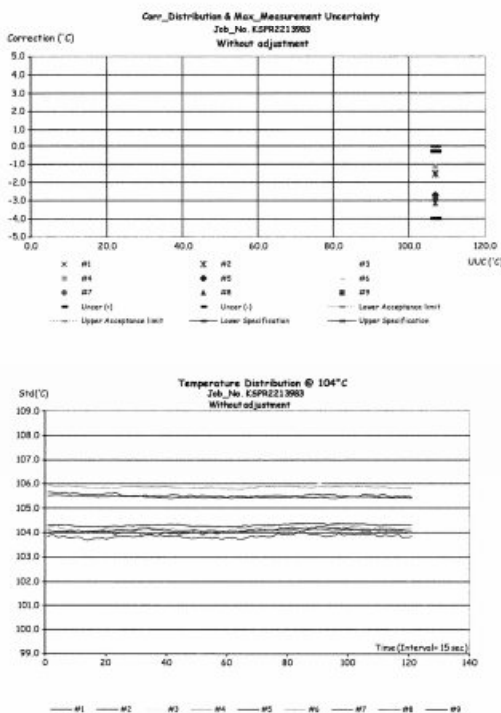
ตรวจสอบ (วัน)	รายการตรวจเช็ค	ตรวจสอบ (วัน)	หมายเหตุ
01 Nov 2022		01 Nov 2022	
ปกติ	ไม่ปกติ	ปกติ	ไม่ปกติ
General			
<input checked="" type="checkbox"/>	<input type="checkbox"/> 1. สายไฟ	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/> 2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/> 3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/> 4. การแสดง Display	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/> 5. การทำงาน ฟัดด	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/> 6. สลัก Lever of Ventilation valve	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/> 7. สลัก Lever door open / close	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/> 8. สลัก Door seal	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/> 9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/> 10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/> 11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/> 12. สลักตัวเครื่อง	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/> 13. สลักการวัดอุณหภูมิ สถานะเซ็นเซอร์	<input checked="" type="checkbox"/>	

ผู้ตรวจสอบ:

Mr. Piypat Saidoung  
Service Engineer

DKSH Calibration Services (UK) Ltd  
DKSH Technology Limited  
2023 Roadside Industrial Estate, Kluang, Johor Bahru, Malaysia 81000  
2023 Roadside Industrial Estate, Kluang, Johor Bahru, Malaysia 81000  
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## Certificate of Calibration

Certificate No.: C31222107

Page: 2 of 3

**Equipment:** Oven  
**Model:** ED 115  
**Serial No./or ID:** 950360  
**Manufacturer:** Binder  
**Condition:** In Condition  
**Shelves(pc.):** 2

**Certificate No.:** C31222107  
**Issued Date:** 05 November 2022  
**Job No.:** KSPR2213982  
**Page:** 1 of 3  
**Ventilation Valve:** Closed

**Customer:** Double A (1991) Public Company Limited,  
 1 Moo 2, Thaloem, Srimahaphot,  
 Prachinburi 25140 Thailand.

**Environment Condition:** Temperature: 29 °C ± 0.6 °C  
 Humidity: 54 %RH ± 4.2 %RH  
 Voltage: 228 VAC ± 3.2 VAC

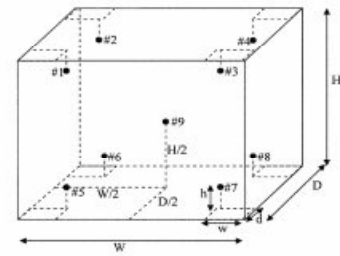
**Calibration Place:** Double A (1991) Public Company Limited. (Environmental Laboratory 02)  
 1 Moo 2, Thaloem, Srimahaphot,  
 Prachinburi 25140 Thailand.

**Calibration By:** Mr. Piysat Seidoung

**Calibration Date:** 01 November 2022

**The Method used:** In house method, CAL-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. C10220001



## Standard Installation Locations

Volume (Calibration Zone)= 20 (Liters)

Inside chamber: W = 51 (cm) D = 40 (cm) H = 53 (cm)

Standard Locations (#1, #2, #3, #4): w = 10 (cm) d = 10 (cm) h = 10 (cm)

Standard Locations (#5, #6, #7, #8): w = 10 (cm) d = 10 (cm) h = 10 (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.

File location not full file  
 DKSH Technology Limited  
 2533 Rungtongthai Road, Bangkok, Thailand 10300  
 Phone: +66 2039 7900 Email: info.calibration@dksh.com Website: www.dksh.com/calibration

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CAL-FM-C31-10: 12 Sep 2022

## Calibration Results:

Certificate No.: C31222107

Page: 3 of 3

## Pre-Calibration

**Setting:** Indicating: #1: #2: #3: #4: #5: #6: #7: #8: #9:  
 104 104 103.96 104.05 103.78 104.06 103.36 102.96 102.91 102.93 102.85

## Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 105 °C

Locations	Measured Temperature (°C)	Correction of UUC, (°C)	Uncertainty (± °C)
#1	104.88	-0.12	0.72
#2	104.97	-0.03	0.72
#3	104.71	-0.29	0.72
#4	104.94	-0.06	0.72
#5	104.19	-0.81	0.72
#6	103.89	-1.11	0.74
#7	103.83	-1.17	0.72
#8	103.87	-1.13	0.73
#9	103.76	-1.24	0.72

## Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)	Uncertainty (± °C)
104	105	105	104.88 104.97 104.71 104.94 104.19 103.89 103.83 103.87 103.76	0.74

## Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
105	1.29	0.16	1.35

Note: \* Maximum uncertainty of the each position

The End of Certificate

File location not full file  
 DKSH Technology Limited  
 2533 Rungtongthai Road, Bangkok, Thailand 10300  
 Phone: +66 2039 7900 Email: info.calibration@dksh.com Website: www.dksh.com/calibration

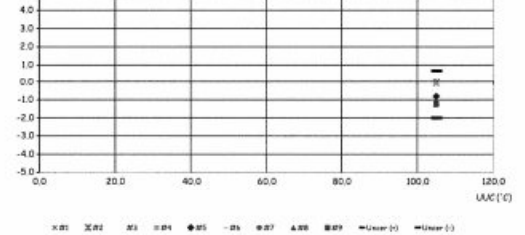
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CAL-FM-C31-10: 12 Sep 2022

## Corr. Distribution &amp; Max. Measurement Uncertainty

Job No. KSPR2213982

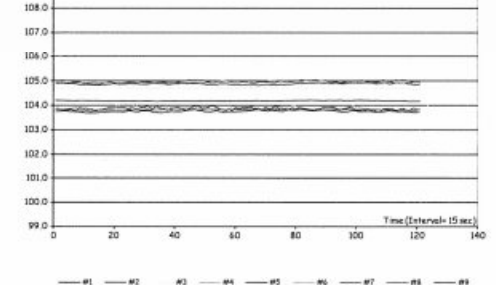
Without adjustment



## Temperature Distribution @ 104 °C

Job No. KSPR2213982

Without adjustment



## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR221352

ชนิดเครื่องมือ: Oven  
หมายเลขเครื่อง: 850360

รุ่น: ED 115

ตรวจสอบ (ปี)	รายการตรวจเช็ค	ตรวจสอบ (ตัว)	หมายเหตุ
01 Nov 2022		01 Nov 2022	
ปกติ	ไม่ปกติ	ปกติ	ไม่ปกติ
<b>General</b>			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดง Display	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน ฟิวส์	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สลัก Lever of Ventilation valve	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สลัก Lever door open / close	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สลัก Door seal	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สลักปรับเครื่อง	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สลักควบคุมอุณหภูมิ	<input checked="" type="checkbox"/>

ผู้ตรวจ:

Mr. Piypat Saisoung  
Service Engineer

DKSH Technology Limited  
2533 ซอยสุขุมวิท 48 แขวงคลองเตย เขตคลองเตย กรุงเทพฯ 10110  
2533 Sukhumvit Road, Bangkok, Thailand 10110  
Phone: +66 2039 1980 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

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## Certificate of Calibration

**Equipment:** Cooled incubator  
**Model:** ES50C  
**Serial No.(or ID):** 3021  
**Manufacturer:** OmRon  
**Condition:** In Condition  
**Shelves(pc.):** 9

**Certificate No.:** C31222114  
**Issued Date:** 07 November 2022  
**Job No.:** KSPR2213525  
**Page:** 1 of 3  
**Ventilation Valve:** None

**Customer:** Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thathom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

**Environment Condition:** Temperature: 26 °C ± 0.4 °C  
Humidity: 51 %RH ± 4.2 %RH  
Voltage: 229 VAC ± 1.7 VAC

**Calibration Place:** Integrated Research Center Co.,Ltd.( Environmental Laboratory 02 )  
122 Moo 2, Tambol Thathom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

**Calibration By:** Mr. Piypat Saisoung  
**Calibration Date:** 31 October 2022  
**The Method used:** In house method, CAL-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. C10220001

(Mr. Piypat Saisoung)

Person in charge

(Mr. Udon Srichana)

Authorized signatory

This certificate is issued for the purpose of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated in 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.

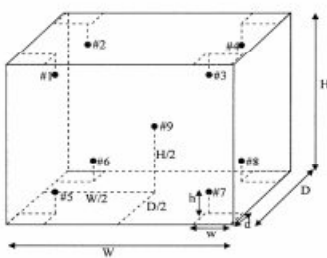
DKSH Technology Limited  
2533 ซอยสุขุมวิท 48 แขวงคลองเตย เขตคลองเตย กรุงเทพฯ 10110  
2533 Sukhumvit Road, Bangkok, Thailand 10110  
Phone: +66 2039 1980 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

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CAL-FM-C31-10: 12 Sep 2022

Certificate No.: C31222114

Page: 2 of 3



## Standard Installation Locations

Volume (Calibration Zone): 422 (Liters)

Inside chamber: W = 110 (cm) D = 60 (cm) H = 160 (cm)

Standard Locations (#1, #2, #3, #4): w = 11 (cm) d = 6 (cm) h = 30 (cm)

Standard Locations (#5, #6, #7, #8): w = 11 (cm) d = 6 (cm) h = 30 (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.

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2533 Sukhumvit Road, Bangkok, Thailand 10110  
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CAL-FM-C31-10: 12 Sep 2022

Certificate No.: C31222114

Page: 3 of 3

## Calibration Results:

## Before adjustment

Setting: Indicating: #1: #2: #3: #4: #5: #6: #7: #8: #9:  
20 21 20.86 20.44 20.70 20.62 20.02 20.03 19.94 20.21 20.46

## After adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 21 °C

Locations	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
#1	20.71	-0.29	0.67
#2	20.23	-0.77	0.67
#3	20.53	-0.47	0.68
#4	20.38	-0.62	0.65
#5	20.02	-0.98	0.75
#6	19.97	-1.03	0.62
#7	19.99	-1.01	0.65
#8	20.11	-0.89	0.70
#9	20.23	-0.77	0.68

## Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)
20	20	21	20.71	20.23	20.53	20.38	20.02	19.97	19.99	20.11	20.23	0.65

## Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
21	0.61	0.51	1.37

Note: \* Maximum uncertainty of the each position

The End of Certificate

DKSH Technology Limited  
2533 ซอยสุขุมวิท 48 แขวงคลองเตย เขตคลองเตย กรุงเทพฯ 10110  
2533 Sukhumvit Road, Bangkok, Thailand 10110  
Phone: +66 2039 1980 Email: info.calibration@dksh.com Website: www.dksh.com/calibration-thailand

Delivering Growth - In Asia and Beyond.

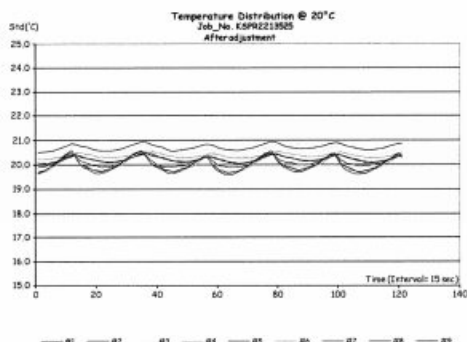
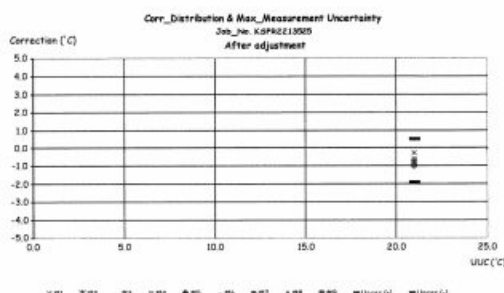
CAL-FM-C31-10: 12 Sep 2022

**ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ**

เลขที่ใบงาน: KSPR2213525

ชนิดเครื่องมือ: Cooled Incubator  
หมายเลขเครื่อง: 03021

รุ่น: ESCC



ตรวจสอบ (รับ)		รายการตรวจสอบ (ส่ง)	ตรวจสอบ (ส่ง)		หมายเหตุ
31 Oct 2022			31 Oct 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. การแสดง Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน ฟิลเตอร์	<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. สภาพกลิ่นห้อง	<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"/>	

ชื่อคนทำ:

Mr. Piyaapat Saidoung  
Service Engineer

DKSH Technology Limited  
2533 Sukhumvit Road, Bangkok, Thailand 10260  
Phone: +66 2039 7800 Email: info.calibration@dksh.com Website: www.dksh.com/calibration/thailand  
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**Certificate of Calibration**

Certificate No.: C31222115 Page: 2 of 4

**Equipment:** Cooled Incubator  
Model: i250  
Serial No.(or ID): 0213-0004  
Manufacturer: accuplus  
Condition: In Condition  
Shelves(pc.): 4

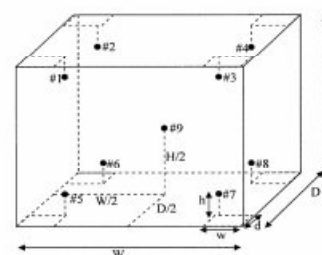
**Certificate No.:** C31222115  
**Issued Date:** 07 November 2022  
**Job No.:** KSPR2213525  
**Page:** 1 of 4  
**Ventilation Valve:** None

**Customer:** Integrated Research Center Co.,Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

**Environment Condition:** Temperature: 28 °C ± 0.6 °C  
Humidity: 50 %RH ± 4.5 %RH  
Voltage: 230 VAC ± 3.2 VAC

**Calibration Place:** Integrated Research Center Co.,Ltd.( Environmental Laboratory 02 )  
122 Moo 2, Tambol Thatoom,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

**Calibration By:** Mr. Piyaapat Saidoung  
**Calibration Date:** 01 November 2022  
**The Method used:** In house method, CAL-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. C10220001



**Standard Installation Locations**

Volume (Calibration Zone)= 116 (Liters)

Inside chamber: W = 50 (cm) D = 48 (cm) H = 106 (cm)  
Standard Locations (#1, #2, #3, #4): w = 5 (cm) d = 5 (cm) h = 20 (cm)  
Standard Locations (#5, #6, #7, #8): w = 5 (cm) d = 5 (cm) h = 10 (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.

(Mr. Piyaapat Saidoung)  
Person in charge

(Mr. Udon Sirichana)  
Authorized signatory

This certificate is issued in the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated in the 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).  
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CAL-FM-C31-10: 12 Sep 2022

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CAL-FM-C31-10: 12 Sep 2022

**Calibration Results:**  
**Without adjustment**

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

Locations	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
#1	20.43	0.43	0.27
#2	20.33	0.33	0.28
#3	20.46	0.46	0.34
#4	20.21	0.21	0.40
#5	20.28	0.28	0.30
#6	20.36	0.36	0.27
#7	20.03	0.03	0.37
#8	20.16	0.16	0.30
#9	20.25	0.25	0.37

**Temperature Distribution**

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
20.0	20.0	20.0	20.43	20.33	20.46	20.21	20.28	20.36	20.03	20.16	20.25	0.40

**Chamber Characterization**

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
20.0	0.34	0.29	0.91

Note: \* Maximum uncertainty of the each position

**Without adjustment (Cont.)**

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 29.0 °C

Locations	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
#1	29.00	0.00	0.29
#2	28.90	-0.10	0.30
#3	29.06	0.06	0.33
#4	28.91	-0.09	0.35
#5	28.97	-0.03	0.32
#6	28.98	-0.02	0.28
#7	28.86	-0.14	0.37
#8	28.89	-0.11	0.31
#9	28.92	-0.08	0.37

**Temperature Distribution**

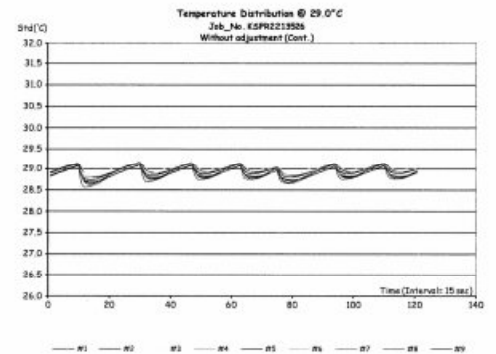
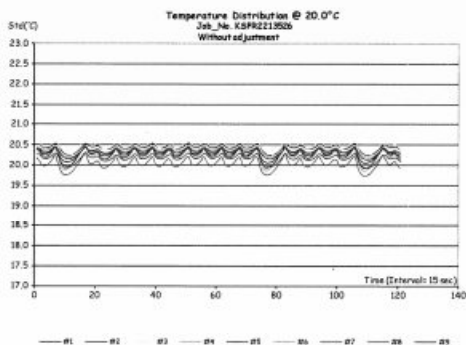
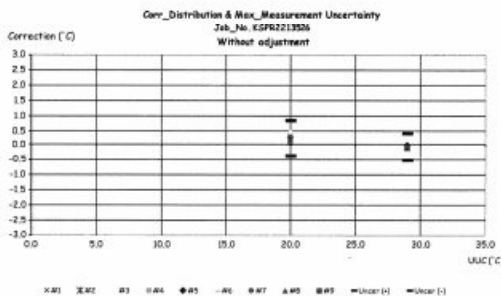
Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
29.0	29.0	29.0	29.00	28.90	29.06	28.91	28.97	28.98	28.86	28.89	28.92	0.37

**Chamber Characterization**

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
29.0	0.20	0.27	0.70

Note: \* Maximum uncertainty of the each position

**The End of Certificate**



## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

## Certificate of Calibration

ชนิดเครื่องมือ: Cooled Incubator  
หมายเลขเครื่อง: 0213-0004

รุ่น: Q50

เลขที่ใบงาน: KSPR2213526

Equipment: COD Reactor  
Model: DRB200  
Serial No. (or ID.): 19070C0337  
Manufacturer: HACH  
Condition: In Condition  
Covers: Open (Max) Locations heating Block: Left and Right

Certificate No.: C17220184  
Issued Date: 08 November 2022  
Job No.: KSPR2213527  
Page: 1 of 5

Customer: Integrated Research Center Co., Ltd.  
122 Moo 2, Tambol Thaloem,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature: 29 °C ± 0.8 °C  
Humidity: 52 %RH ± 4.7 %RH  
Voltage: 229 VAC ± 2.3 VAC

Calibration Place: Integrated Research Center Co., Ltd. (Environmental Laboratory 02 )  
122 Moo 2, Tambol Thaloem,  
Amphur Srimahaphote, Prachinburi 25140 Thailand

Calibration By: Mr. Piysat Saidoung  
Calibration Date: 31 October 2022  
The Method used: In house method, base on Direct Measurement with Standard Thermometer  
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C10220002

ตรวจสอบ (รับ)	ตรวจสอบ (ส่ง)	หมายเหตุ
01 Nov 2022	01 Nov 2022	
ปกติ	ไม่ปกติ	
<b>General</b>		
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1. สายไฟ
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2. การทำงาน Main Switch
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	3. การทำงาน Selector Key
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	4. การแสดง Display
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	5. การทำงาน ฟลิท
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	7. สภาพ Lever door open / close
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	8. สภาพ Door seal
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	9. การทำงานของระบบ Safety
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	10. การทำงานของระบบทำความเย็น
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	12. สภาพตัวเครื่อง
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	13. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง

ชื่อผู้รับ:

Mr. Piysat Saidoung  
Service Engineer

(Mr. Piysat Saidoung)  
Person in charge

(Mr. Udon Srichana)  
Authorized signatory

This certificate is issued on the basis of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standards or other recognized national standard laboratories. The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

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

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SPCC-FM-C17-08; 20 Jul 2022

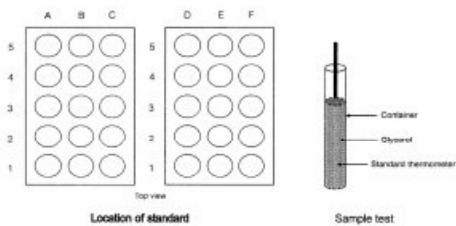
Certificate No.: C17220184

Page: 2 of 5

Certificate No.: C17220184

Page: 3 of 5

### Calibration Results: Before Adjustment



#### Standard Installation Locations

The standard thermometer touches the lower end of the boring

#### Definitions

- Indicating Temperature:** The average reading of indicating device which forms the integral part of the unit under calibration.
- Measured Temperature:** The average reading of standards at any positions or location.
- Measured Stability:** The one-half of greatest maximum difference of measured temperatures at any one probe.

Locations heating Block:	Setting (°C)	Unit Under Calibration (°C)
Left	150	150
Right	150	150

Location heating Block:	A1	A2	A3	A4	A5
Measured Temperature (°C)	151.42	150.94	152.00	150.80	150.25

Location heating Block:	B1	B2	B3	B4	B5
Measured Temperature (°C)	150.28	152.51	152.43	152.92	149.79

Location heating Block:	C1	C2	C3	C4	C5
Measured Temperature (°C)	150.39	152.17	152.38	151.13	150.71

Location heating Block:	D1	D2	D3	D4	D5
Measured Temperature (°C)	152.64	152.36	152.22	151.44	152.80

Location heating Block:	E1	E2	E3	E4	E5
Measured Temperature (°C)	152.26	152.75	153.81	153.43	151.45

Location heating Block:	F1	F2	F3	F4	F5
Measured Temperature (°C)	150.92	152.98	153.63	153.50	153.20

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SPCC-FM-C17-08; 20 Jul 2022

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SPCC-FM-C17-08; 20 Jul 2022



### Calibration Results:

#### After Adjustment

Measured temperature at the spread locations:

Locations heating Block:	Setting (°C)	Unit Under Calibration (°C)
Left	150	150
Right	150	150

Location heating Block:	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
A1	149.94	-0.06	0.66
A2	149.36	-0.64	0.66
A3	150.55	0.55	0.66
A4	149.24	-0.76	0.66
A5	148.74	-1.26	0.66
B1	149.04	-0.96	0.70
B2	150.49	0.49	0.66
B3	149.92	-0.08	0.66
B4	151.36	1.36	0.66
B5	148.46	-1.54	0.65
C1	148.77	-1.23	0.66
C2	150.53	0.53	0.66
C3	150.67	0.67	0.66
C4	149.64	-0.36	0.66
C5	148.97	-1.03	0.65
D1	149.70	-0.30	0.66
D2	151.03	1.03	0.67
D3	149.61	-0.39	0.67
D4	148.96	-1.02	0.67
D5	150.56	0.56	0.67
E1	149.45	-0.55	0.67
E2	149.90	-0.10	0.67
E3	150.77	0.77	0.67
E4	150.91	0.91	0.67
E5	149.09	-0.91	0.67
F1	148.74	-1.26	0.67
F2	150.00	0.00	0.67
F3	150.90	0.90	0.67
F4	150.89	0.89	0.67
F5	150.31	0.31	0.67

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DKSH Technology Limited  
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110  
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SPCC-FM-C17-06: 20 Jul 2022

### Characterization of the unit under calibration:

Locations heating Block	Desired (°C)	Unit Under Calibration (°C)	Measured Temperature (°C)
Left	150	150	150
Right	150	150	150

The End of Certificate

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SPCC-FM-C17-06: 20 Jul 2022

### ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2213527

ชนิดเครื่องวัด: COO Reactor  
หมายเลขเครื่อง: 19070C0337

รุ่น: DR3900

ตรวจสอบ (ปี)	รายการตรวจเช็ค	ตรวจสอบ (ชื่อ)	หมายเหตุ
31 Oct 2022		31 Oct 2022	
ปกติ / ไม่ปกติ		ปกติ / ไม่ปกติ	
	General		
<input checked="" type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	4. การแสดง Display	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	5. สลัก Hole	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	6. สภาพหน้าปัด	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	7. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/>	8. สลักตรวจสอบ ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	

ลงนาม: \_\_\_\_\_

Mr. Piyapat Saidoung  
Service Engineer

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### Certificate of Calibration

**Equipment:** SPECTROPHOTOMETER  
**Model:** DR3900  
**Serial No. (or ID.):** 1918120  
**Manufacturer:** HACH  
**Condition:** In Condition  
**Certificate No.:** C06220563  
**Issued Date:** 05 November 2022  
**Job No.:** KSPR2213520  
**Page:** 1 of 3  
**Customer:** Double A (1991) Public Company Limited.  
1 Moo 2, Thatoom, Srimahaphot.  
Prachinburi 25140 Thailand.  
**Environment Condition:** Temperature 28.4 °C ± 0.2 °C  
Humidity 53.4 %RH ± 2.2 %RH  
**Calibration Place:** Double A (1991) Public Company Limited. (Environmental Laboratory 01)  
1 Moo 2, Thatoom, Srimahaphot.  
Prachinburi 25140 Thailand.  
**Calibration By:** Mr. Piyapat Saidoung  
**Calibration Date:** 31 October 2022  
**The Method used:** In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04  
**Traceability:** This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.  
The standard for Wavelength Certificate No. 105931 and 105898  
The standard for Photometric Certificate No. 105940  
The standard for Stray light Certificate No. 105900

(Mr. Piyapat Saidoung)  
Person in charge

(Mr. Thakongkiet Pongngam)  
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).  
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CAL-FM-C06-15: 12 Sep 2022

### Calibration Results:

#### Without Adjustment

Wavelength Accuracy (nm), The spectral bandwidth of Std at 5 nm and UUC at 5 nm				
Standard Wavelength	Unit Under Calibration	Correction	Uncertainty	
418.40	418	0.40	0.59	
459.30	459	0.30	0.59	
638.00	638	0.00	0.59	
585.56	586	-0.44	0.59	
747.61	748	-0.39	0.59	
807.04	807	0.04	0.59	

Photometric Accuracy (Absorbance)				
Wavelength	Standard Absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.000	0.0000	0.0045
	0.5890	0.587	0.0020	0.0045
	0.7604	0.759	0.0014	0.0045
	1.0241	1.023	0.0011	0.0045
440 nm	0.0000	0.000	0.0000	0.0045
	0.5782	0.576	0.0022	0.0045
	0.7430	0.741	0.0020	0.0045
	1.0016	1.000	0.0016	0.0045
465 nm	0.0000	0.000	0.0000	0.0045
	0.5283	0.528	0.0003	0.0045
	0.8854	0.886	-0.0006	0.0045
	0.9909	0.951	-0.0391	0.0045
546.1 nm	0.0000	0.000	0.0000	0.0045
	0.5457	0.544	0.0017	0.0045
	0.8944	0.892	0.0024	0.0045
	0.9905	0.994	-0.0035	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5837	0.580	0.0037	0.0045
	0.7223	0.718	0.0043	0.0045
	1.0935	1.089	0.0045	0.0045
635 nm	0.0000	0.000	0.0000	0.0045
	0.5875	0.585	0.0025	0.0045
	0.8900	0.887	0.0030	0.0045
	1.0862	1.083	0.0032	0.0045

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CAL-FM-C06-15 12 Sep 2022

### Calibration Results:

#### Without Adjustment

Stray light *	UUC: Wavelength (nm)	UUC: Transmission (%)	Absorbance (A)
391.23 +/- 0.11 nm	391	2.7	1.569

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

The End of Certificate

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CAL-FM-C06-15 12 Sep 2022

### ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: KSPR2213520

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: DR3900 หมายเลขเครื่อง: 1918120

ตรวจสอบ (ปี)		รายการตรวจ		ตรวจสอบ (ปี)		หมายเหตุ
31 Oct 2022		ปกติ	ไม่ปกติ	31 Oct 2022		
ปกติ	ไม่ปกติ			ปกติ	ไม่ปกติ	
<b>General</b>						
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ เปิด - ปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<b>Spectrophotometer</b>						
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. แบตเตอรี่สำรอง (Battery Backup) >= 2.5 VDC	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การควบคุมความยาวคลื่น (Wavelength Control)	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	607nm=607.2nm	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV < 3,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible < 5,000 hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. ช่องใส่ตัวอย่าง (Carousel Module)	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<b>pH Meter and Conductivity Meter</b>						
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. ขั้วไฟฟ้า (Electrode and Connection Cable)	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลาย (Electrode (Level KCl))	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดป้องกันขั้วไฟฟ้า (Dust Protection Hood)	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	15. ขาตั้งขั้วไฟฟ้า (Stand)	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<b>Turbidimeter</b>						
<input checked="" type="checkbox"/>	<input type="checkbox"/>	16. ค่าความขุ่นตัวอย่าง (No Sample)	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	17. ระดับการปล่อยตัวอย่าง (>= 2.5 ไมครอน 3.0)	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<b>Automatic titrator</b>						
<input checked="" type="checkbox"/>	<input type="checkbox"/>	18. หัวฉีด Piston Burettes	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	20. ระบบจ่ายสารละลายอัตโนมัติ	<input checked="" type="checkbox"/>	<input type="checkbox"/>		

เซ็นเซอร์อุณหภูมิ:

Mr. Piysat Saidoung  
Service Engineer

DKSH Technology Limited  
2513 Sukhumvit Road, Bangkok, Thailand 10260  
Phone: +66 2039 7000 Email: info@dksh.com Website: www.dksh.com

Delivering Growth - in Asia and Beyond.

CAL-FM-R31-03 20 Jul 2022

### Certificate of Calibration



Equipment: Liquid Bath  
Model: WNB22/TCWAL  
Serial No. (or ID.): L508.0973  
Manufacturer: Memmert/Automatics  
Condition: In Condition  
Forced Circulation: None

Certificate No.: C13220378  
Issued Date: 07 November 2022  
Job No.: KSPR2213523  
Page: 1 of 3

Customer: Integrated Research Center Co., Ltd.  
122 Moo 2, Tambol Thatoom,  
Amphur Srirachaphote, Prachinburi 25140 Thailand

Environment Condition: Temperature: 28 °C ± 0.7 °C  
Humidity: 62 %RH ± 4.7 %RH  
Voltage: 229 VAC ± 2.6 VAC

Calibration Place: Integrated Research Center Co., Ltd. (Environmental Laboratory 01)  
122 Moo 2, Tambol Thatoom,  
Amphur Srirachaphote, Prachinburi 25140 Thailand

Calibration By: Mr. Chaiwat Srisanguan  
Calibration Date: 31 October 2022  
The Method used: In house method, CAL-WH-17, base on ASTM E715-80  
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C10220001

(Mr. Piysat Saidoung)  
Person in charge

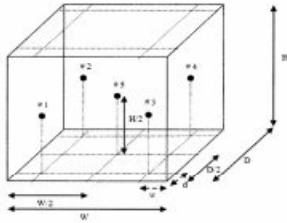
(Mr. Udon Srichana)  
Authorized signatory

This certificate is issued for the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.  
The measurement uncertainty stated in the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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CAL-FM-C15-13 12 Sep 2022



**Standard Installation Locations**

Midway between the diffuser plate and the water surface

Inside bath: W = 36 (cm) D = 32 (cm) H = 34 (cm) Volume = 39 (Liters)

Standard Locations #1: w = 5 (cm) d = 5 (cm)

Standard Locations #2: w = 5 (cm) d = 5 (cm)

Standard Locations #3: w = 5 (cm) d = 5 (cm)

Standard Locations #4: w = 5 (cm) d = 5 (cm)

Standard Locations #5: Center of any probes. (#1 - #4)

Position of Std	#1	#2	#3	#4	#5
Channel of Logger	1	2	3	4	5

**Definitions**

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

**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 bath at steady-state. The reference probe is preferably located in the geometric center of the bath.

**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.

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CAL-FM-C13-13: 12 Sep 2022

**Calibration Results:**

**Without adjustment**

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 85 °C

Locations	Measured Temperature (°C)	Correction of UUC (°C)	Uncertainty (± °C)
#1	85.42	0.42	1.1
#2	85.33	0.33	1.1
#3	85.38	0.38	1.2
#4	85.44	0.44	1.1
#5	85.34	0.34	1.1

**Temperature Distribution**

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)					Uncertainty (± °C)
			#1	#2	#3	#4	#5	
85	85	85	85.42	85.33	85.38	85.44	85.34	1.2

**Bath Characterization**

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
85	0.29	0.54	1.10

Note: \* Maximum uncertainty of the each position

The End of Certificate

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CAL-FM-C13-13: 12 Sep 2022

**ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ**

เลขที่ใบงาน: KSPR2213523

ชนิดเครื่องใช้: Liquid Bath

รุ่น: WNB22/TCN4L

หมายเลขเครื่อง: L508.0973

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		<b>General</b>			
<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. การแสดง Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน Circulator	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สวิทช์ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. ท่อระบายน้ำ (DRAIN)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	8. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. สภาพตู้เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. สภาพแวดล้อม ณ สถานที่ติดตั้ง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

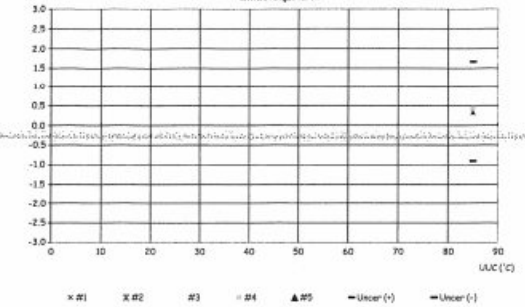
ลงนาม: \_\_\_\_\_

Mr. Chaiwat Srisenguan  
Service Engineer

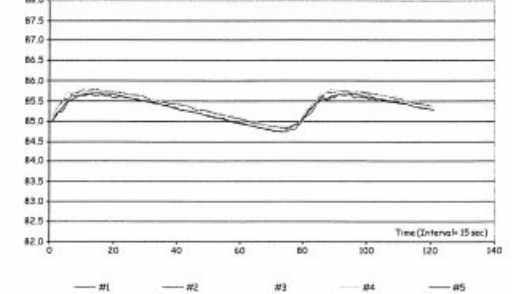
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**Corr. Distribution & Max. Measurement Uncertainty**  
Job No: KSPR2213523  
Without adjustment



**Temperature Distribution @ 85°C**  
Job No: KSPR2213523  
Without adjustment



Certificate Number CPH-0018-22

Calibration Certificate  
Seven2Go™ Polarographic DO S4

## Customer

Company: INTEGRATED RESEARCH CENTER CO., LTD.

Address:

122 Moo 2,

T. Toon, A. Srinakharaphi

PRACHINBURJ 25140

Customer ID number:

301904759

Order Number:

123 123456789

## Instrument

Type: Seven2Go™ Polarographic DO S4

Instrument Serial Number: C13602714

Internal Identification:

Firmware version: 1.00

## Technical specifications

Measuring Range: 0.00 ... 99.9 mg/L (ppm) 0.0 ... 600 %  
Resolution: 0.01 mg/L 0.1 %  
Limit of Error:  $\pm 0.2$  mg/L in range 0 ... 15  
 $\pm 10$  % in range 15 ... 60

Temperature range ATC: -6 ... +35 °C Pressure range: 500 ... 1100 mbar  
Resolution: 0.1 °C Resolution: 1 mbar  
Limit of Error:  $\pm 0.2$  °C Limit of Error:  $\pm 2$  %

## Procedure Statement

METTLER TOLEDO Seven2Go Service Manual Section 9 (Doc. No. 30232219) will be used as reference documentation to adjust and verify the instrument indicated in the "Type" and "Serial number" section. The measurement results of this certification were obtained at ambient conditions.



Certificate Number CPH-0018-22

## Certification Tools

Certified digital voltmeter Manufacturer: Xicon Technologies  
Control No: ANA81 Serial number: 2020-01-1512-00003  
Certificate number: ETU021393  
Date of Certification: April 1, 2022

DO Calibration Kit Manufacturer: METTLER TOLEDO / MS-01002345  
Type: 2102345 Serial number: 90165  
Control No: ANA30 Certificate number: 2022-01-00001  
Due Date: October 27, 2022

Designation	Nominal value	Certified value
DO 10 mS	10.000 MS	10.0642 MS
DO 1 mS	1.000 MS	1.0151 MS

Designation	Nominal value	Certified value
NTC 22 kΩ, 6 °C	95.180 kΩ	95.1659 kΩ
NTC 22 kΩ, 25 °C	22.000 kΩ	21.9922 kΩ
NTC 22 kΩ, 35 °C	8.448 kΩ	8.4487 kΩ

Barometric pressure meter Manufacturer: TESTO / 0560 5113 Serial number: 30605905  
(Testo 511) Control No: ANA31 Certificate number: 2024131  
Due Date: October 7, 2022



Mettler-Toledo (Thailand) Limited

## Performance Test

Control No. CPH-0018-22 / 1

Certificate Number CPH-0018-22

## Certification Measurements

Designation	Theoretical current	Measured value	Max. Tolerance	Passed / Failed
5mA	495.00 mA	495.00 mA	±0.5 %	Passed
10 mA	990.00 mA	990.00 mA	±0.5 %	Passed
1 mA	99.00 mA	99.00 mA	±0.5 %	Passed

Designation	Nominal value	Measured value	Max. Tolerance	Passed / Failed
NTC 22 kΩ, 0 °C	95.180 kΩ	95.180 kΩ	±0.2 °C	Passed
NTC 22 kΩ, 25 °C	22.000 kΩ	21.992 kΩ	±0.2 °C	Passed
NTC 22 kΩ, 35 °C	8.448 kΩ	8.449 kΩ	±0.2 °C	Passed

Designation	Measured value Certified meter	Measured value DO meter	Max. Tolerance	Passed / Failed
Ambient pressure	1015.0 mbar	1015 mbar	±2 %	Passed

## Summary of Certification

Certification of instrument ☒ Passed

The instrument referred to in this certificate has fulfilled the criteria of the certification. This is indicated by the notation "Passed" in the column above.

Remarks:

Certification of the instrument was performed by:

Service Specialist: Sookjai Sriwatt Place: Laboratory room

Calibration Date: January 10, 2022 Signature: ELECTRONIC SIGNATURE



Mettler-Toledo (Thailand) Limited

## Performance Test

Control No. CPH-0018-22 / 1

Company: INTEGRATED RESEARCH CENTER CO., LTD.

Address: 122 Moo 2, T. Toon, A. Srinakharaphi

PRACHINBURJ 25140

Assignment ID: "03701602673"

## DO Electrode

Type: InLab 605-ISM S/N: 1471235

## Measurement

Test	Measurement Probe	
	Before Adjustment	After Adjustment
Air	98.8%	95.4%
Pressure	1014 mbar	1014 mbar
Temperature	26.4 °C	26.3 °C

Remarks: Laboratory room Calibration Date: January 13, 2022  
Place: Laboratory room Signature: Electronic Signature



## Agilent CrossLab Start Up Services

### Agilent 5100 5110 ICP-OES Preventive Maintenance

#### Introduction

##### Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures. Customers are responsible for regular maintenance and are encouraged to observe the service representative.
- Any parts not included in the Parts Lists section of this document are not part of the recommended Preventive Maintenance service nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.
- For customers using HF applications, the instrument should be returned to its standard sample introduction system.

Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results.

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides what you need to reduce unplanned downtime and keep your systems operating at their peak performance.

This checklist is used as a guide for completing the preventive maintenance tasks. A signed copy of this checklist is provided for your records.

#### Important Customer Web Links

- To access **Agilent University**, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- To access the **Agilent Resource Center** web page, visit <https://www.agilent.com/en-us/agilentresources>. The following information topics are available:
  - Sample Prep and Containment
  - Chemical Standards
  - Analysis
  - Service and Support
  - Application Workflows
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>.
- Videos about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>.
- **Need to place a service call?** Flexible Repair Options | Agilent

#### Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "**Service not applicable**" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance services in the most logical order relevant to the individual system service in the order of the tasks listed.
- Complete the **Service Review** section together with the customer.
- Complete the fields for page numbers at the foot of each selected page.
- Add relevant page numbers to selected pages and complete the total number of pages field in the Service Completion section.
- **Ask the customer to sign the Service Verification section including the customer's and your signature.**

## Instrument Maintenance

### System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument System Name and ID	5110 ICP-OES
Instrument System Site and Location	Integrated Research Center

List System Component Product Numbers	List the Serial Numbers of each Component
1. G8015 A	MY 19351008
2. G8481 A	1907 - 00426
3.	
4.	
5.	
6.	
7.	
8.	
9.	

ICP-OES Configuration Table	Circle the type or write in the type if other
Nebulizer Type	SeaSpray OneNeb   Conical   Other
Spray Chamber	Cyclonic Single Pass Cyclonic Double Pass   Other
Torch	Radial Dual View   Other
Torch Type	One Piece Semi Demountable   Fully Demountable   Other
Injector Diameter	2.4mm 1.8mm 1.4mm   0.8mm   Other
Injector Material	Quartz Ceramic   Other

### Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components and implementation of Service Notes
- ☒ Check for required firmware/software updates and verify with customers if they would like them installed.
- ☒ For HF application systems, if standard sample introduction system was not installed, ask the customer to install it.
- ☒ Ask the customer to remove any samples from the ICP-OES sample introduction area, auto sampler or around the ICP-OES.

## Preventive Maintenance Procedures

### Record Pre-PM instrument performance

- ☒ Run Instrument Performance test.
- ☒ Record results in Instrument Performance Test Results Table – Pre-PM.

### Clean and inspect ICP-OES system

- ☒ Look for any obvious external damage or problems.
- ☒ Inspect water cooling hoses, gas lines and power cord for excessive wear or damage.
- ☒ Perform a general internal inspection of the system for excessive dust accumulation, clean if necessary.
- ☒ Inspect sample introduction components and record any required maintenance in the Service Engineer Comments and notify the customer as the required actions required.
- ☒ Record the instrument operating conditions in the ICP-OES Status Results Table.
- ☒ Replace the polychromator purge filter.
- ☒ Replace the radial pre-optics window
- ☒ Replace the axial pre-optics window for SVDV and VDV instruments.
- ☒ Check exhaust flow for the correct positive extraction at the exhaust duct to insure they meet minimum specifications.
- ☒ Replace air inlet dust filter.
- ☒ Replace high capacity air inlet dust filter element if installed.
- ☒ Remove and clean instrument water inlet filter.

### Agilent Water Recirculator

- ☐ Service not applicable
- ☒ Drain cooling fluid and remove any particles from the chiller reservoir
- ☒ Remove, clean and reinstall water inlet metal mesh filter if present.
- ☒ Re fill with Agilent Cool Clear cooling fluid.
- ☒ Clean the cooling system Air filter and the condenser.

### SPS 3 Auto Sampler

- ☒ Service not applicable
- ☐ Power cycle the autosampler and verify successful initialization.
- ☐ Inspect X and Z axis belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes.
- ☐ Clean X and Z axis slide shafts.
- ☐ Using customer's racks and the Agilent software move the sample probe to the 4 outermost corners and rinse port, ensure that the probe is approximately centered in the vial.

### SPS 4 Auto sampler

- ☒ Service not applicable
- ☐ Clean the spill tray, rack location mat, end frames and chassis with a damp soft cloth and diluted mild detergent.
- ☐ Clean the auto sampler cover panels, if cover kit is installed, with domestic window cleaner
- ☐ Check the X-axis and Z-axis drive belts for cracks, splits, damaged teeth, excessive fraying, color changes or degradation from fumes.
- ☐ Check the X-axis, Theta-axis and Z-axis FFC cables for cracks, incorrect positioning, damaged edges or damaged connectors.
- ☐ Pump Tubing Replacement. Replace peristaltic pump tubing. Replace all tubing that goes from the rinse station to the pump and from the pump to the waste/rinse bottles
- ☐ Test using customer's tray and move the sample probe to the sample vial 1, wash vial and rinse port and ensure that the probe is centered in the vial. If not use calibration wizard and calibrate the position.

### AVS 4, 6, 7 Advanced Valve System

- ☒ Service not applicable
- ☐ Replace valve rotor seal
- ☐ Check fittings for signs of leaks
- ☐ Check tubing including autosampler tubing for kinks or excessive wear
- ☐ Check high flow pump for signs of leaks

## ICP-OES adjustment

- ☒ Check position of Zn peak, adjust if required.
- ☒ Check Argon Ratio, adjust to specified value if required.
- ☒ Perform Detector Calibration.
- ☒ Perform Instrument Calibration.

## Record Post-PM instrument performance

- ☒ Run Instrument Performance test.
- ☒ Record results in Instrument Performance Test Results Table - Post PM.
- ☒ For systems using ICP Expert version 7.3 and above, run the following instrument tests
  - ☒ Subsystem Communications Test
  - ☒ Air Flow
  - ☒ Water Flow
  - ☒ Gas Flows
  - ☒ RF Generator
  - ☒ Camera Test
  - ☒ Optics Test
  - ☒ Nebulizer Test
- ☒ Record the result in the Instrument Test Results Table

## Restore Instrument

- ☒ For HF applications, ask the customer to reinstall their sample introduction system.
- ☒ Leave system in an idle state: on and purging.
- ☒ Guidance: If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

## Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Record the PM event in the Smart Alerts logbook, if applicable.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this service, parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box. Systems in a compliant environment may need additional documentation.
- ☒ Complete the Signature Page with both Service Engineer and Customer signatures.

## Test Results

## Instrument Performance Test Results Table

Note: These measurements do not form part of any specification and are for reference only.

	Pre PM Sensitivity Check		Post PM Sensitivity Check	
	Radial	Axial *	Radial	Axial*
Zn 213.857 nm SRR	1635.4	4472.2	2462.1	7041.7
Mn 257.610 nm SRR	6804.5	24554.9	9363.6	33365.1
Al 396.152 nm SBR	6.4	16.3	8.1	20.2
K 766.491 nm SBR	6.4	10.1	6.5	16.6

\* Axial result is not applicable for G8016AA, G8012AA Radial View instruments.

## Instrument Test Results Table

Note: The Instrument Test results are for systems using ICP Expert version 7.3 and above only.

Instrument Test	Result
Subsystem Communications Test	Pass
Air Flow	Pass
Water Flow	Pass
Gas Flows	Pass
RF Generator	Pass
Camera Test	Pass
Optics Test	Pass
Nebulizer test	Pass

## ICP-OES Status Results Table

Note: These measurements do not form part of any specification and are for reference only.

Measurement	Standby Mode	Plasma On
Mains Voltage	229.767 VAC	229.965 VAC
Mains Current	0.093 A	0.262 A
Instrument Temperature	23.5 °C	24.2 °C
RF Air Flow (sensor speed)	12.0 Hz	16.0 Hz
Plasma Exhaust Temperature	No measurement	59.2 °C
Water Flow Oscillator	No measurement	1.51 L/min
Water Flow Detector	1.17 L/min	1.17 L/min
Water Inlet Temperature	21.0 °C	21.4 °C
Polychromator Temperature	35.6 °C	35.0 °C
CCD Temperature	-39.6 °C	-39.5 °C
Thermal Stabilizer	35.0 °C	35.0 °C
Argon Supply Pressure	586.17 kPa	544.17 kPa
Purge Gas Supply Pressure*1	584.71 kPa	568.77 kPa
Option Gas Supply Pressure*1	0.16 kPa	0.74 kPa
Nebulizer Flow	No measurement	0.70 L/min
Nebulizer Back Pressure	No measurement	291.75 kPa
Plasma Gas Flow	No measurement	12.05 L/min
Auxiliary Gas Flow	No measurement	1.00 L/min
RF Power	No measurement	1202.1 W
RF Supply Current	No measurement	2.500 A
RF Supply Voltage	No measurement	188.730 V

\*1 If option installed

## Consumed PM Parts

Part Description	Part Number	Product or Model# where used	Quantity consumed
Axial Pre-Optic Window	G8010-G8014	G8010A, G8011A, G8014A/G8015A	1
Radial Pre-Optic Window	G8010-G8015	All	1
Agilent Cool Clear Coolant Fluid	5799-0037	Agilent Water Recirculator	
Purge Gas Filter	G8010-60136	All	1
Air inlet filter	G8000-68002	All	1
High Capacity Air Filter	G8010-60189	Optional	
Rotor seal for 6-7 port valve for AV56/7	G8494-60002	G8494A/G8495	
Rotor seal for 4 port valve for AV54	G8493-60002	G8493A	
Rinse solution to rinse station 2.5mm id x 1m	G8410-80123	SPS 4	
Barb connector 2.5mm-1.5mm ID	G8410-80124	SPS 4	
PVC waste tubing, 8mm od x 5mm id, 2m	G8410-80122	SPS 4	
<b>Additional Parts may be required from engineer's stock:</b>			
X axis drive belt	5410047500	SPS 3	
Z axis drive belt	5410047400	SPS 3	
Peristaltic pump tubing, PVC SolvaFlex, 3 bridged	3710049000	SPS 4	

Consumed Parts Reference  
(Purchased by customer, not included as part of PM)☒ Section Not Applicable

Part Description	Part Number	Product or Model# where used	Quantity consumed
------------------	-------------	------------------------------	-------------------

## Signature Page

## Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the installation or other items of interest for the customer, please write in this box.

## Service Verification

Service Request Number: 6005669849 Date Service Completed:

Service Engineer Name: Uthair Ngamler Tsirichai Customer Name:

Service Engineer Signature: Uthair Ng Customer Signature:

Total number of pages in this document: 14



## CALIBRATION CERTIFICATE

 Certificate No.: S2022100447-0001  
 Date Issued: 02-Nov-22

 Customer: Integrated Research Center Co., Ltd.  
 122 Moo 2, Thaloorn, Srimahaphote, Prachinburi 25140

 Equipment: Conductivity Meter  
 Manufacturer: METTLER TOLEDO  
 Model: Seven Easy  
 Serial No.: 1232025828  
 ID No./Tag No.: DARC-TE11047  
 Date Received: 31-Oct-22  
 Date Calibrated: 31-Oct-22  
 Calibrated by: Mr. Chanon Konyawong

Calibration Method or Calibration Procedure Used

In-house method: CP-148 by direct measurement with certified reference material.

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

## Result of Calibration

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

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

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


Page 1 of 2

Certificate No.: S2022100447-0001

 Environment: Ambient Temperature: Start record 27.9 °C, Stop record 27.6 °C  
 Relative Humidity: Start record 53.4 %RH, Stop record 53.6 %RH

## Adjustment:

X Without Adjustment

STD Conductivity Solution	Before Adjusted UUC Reading	After Adjusted UUC Reading	Error	Uncertainty (±)
1499 µS/cm at 24.80°C	1411 µS/cm at 24.8 °C	- µS/cm -	2 µS/cm	7.7 µS/cm $k = 2.00$

STD = Standard

UUC = Unit Under Calibration

Description of UUC: Scale Division 1 µS/cm

Condition As-Received: Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Standard Conductivity Solution:

Standard Conductivity Solution &amp; Traceability:

The International System of Units (SI) through

MIT Certificate No. AD2203-084-0005 for Density solution 1.0 g/ml Serial No. D1713161117, Due 04-Mar-23

Hanna Certificate No. 27D23 for Conductivity 1413 µS/cm @ 25°C Lot No. 7666, Due 04 APR 2027

End of Certificate

Page 2 of 2





## CALIBRATION CERTIFICATE

Certificate No. : S2022100447-0002  
Date Issued : 02-Nov-22

Customer : Integrated Research Center Co., Ltd.  
122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140

Equipment : pH/DO Meter  
Manufacturer : METTLER TOLEDO  
Model : Seven Go Duo  
Serial No. : B932068736  
ID No./Tag No. : -  
Date Received : 31-Oct-22  
Date Calibrated : 31-Oct-22  
Calibrated by : Mr. Chanon Konyawong

### Calibration Method or Calibration Procedure Used

In-house method : CP-42 by direct measurement with pH buffer solution.

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

### Result of Calibration

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

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

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



Page 1 of 2

Certificate No. : S2022100447-0002

Environment : Ambient Temperature : Start record 26.7 °C, Stop record 26.8 °C  
Relative Humidity : Start record 53.4 %RH, Stop record 53.6 %RH

### DC Voltage Measurement Results Part

Nominal Value	STD Applied	UUC Reading	UUC Reading	UUC Error	Uncertainty
(pH)	DC Voltage (mV)	(mV)	(pH)	(mV)	(± mV)
0.00	414.12	414.1	0.00	-0.02	0.17
4.00	177.48	177.5	4.00	0.02	0.12
7.00	0.00	0.0	7.00	0.00	0.059
10.00	-177.48	-177.5	10.00	-0.02	0.12
14.00	-414.12	-414.2	14.00	-0.08	0.17

### Electrode Test Results Part

3 points calibration using standard buffer solutions of pH 4.01, pH 7.01, pH 10.01

Percent Slope : 100.02 at pH 7.01 and 4.01, 100.12 at pH 7.01 and 10.007

Set Slope :

- Hanna Lot No. 7439 for pH 4.01 Buffer Solution, Due 18 FEB 2027
- Hanna Lot No. 7252 for pH 7.01 Buffer Solution, Due 13 DEC 2026
- Hanna Lot No. 7480 for pH 10.01 Buffer Solution, Due 24 FEB 2024

Standard	Before Adjusted	After Adjusted	UUC Error	Uncertainty
pH Solution @ 25° C (pH)	UUC Reading (pH)	UUC Reading (pH)	(pH)	(± pH)
4.000	4.09	4.00	0.009	0.0084
6.985	7.11	7.02	0.035	0.0091
10.007	10.15	10.01	0.003	0.0085

STD = Standard

UUC = Unit Under Calibration

Description of UUC : Range pH 0 to pH 14  
-2000 mV to 2000 mV

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

### Certified Reference Material & Traceability of Certificate :

The International System of Units (SI) through

- YOKOGAWA Certificate No. SCL-22B-0176 for HANDY CAL CA150 Serial No. 23L2009, Due 25-Feb-23
- NIMT Lot No. 160221 for pH 4.000 Buffer Solution, Due 14 DEC 2022
- CPA chem Lot No. 800652 for pH 6.985 Buffer Solution, Due 07 MAR 2023
- NIMT Lot No. 180121 for pH 10.007 Buffer Solution, Due 14 DEC 2022

End of Certificate

Page 2 of 2



## CALIBRATION CERTIFICATE

Certificate No. : S2022100447-0003  
Date Issued : 02-Nov-22

Customer : Integrated Research Center Co., Ltd.  
122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140

Equipment : Oven  
Manufacturer : Binder  
Model : ED 115  
Serial No. : 950360  
ID No./Tag No. : -  
Date Received : 31-Oct-22  
Date Calibrated : 31-Oct-22  
Calibrated by : Mr. Chanon Konyawong

### Calibration Method or Calibration Procedure Used

Standard method : CP-05 TLAS G-20.

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

### Result of Calibration

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

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



Page 1 of 3

Certificate No. : S2022100447-0003

Environment : Ambient Temperature : Start record 25.5 °C, Stop record 25.3 °C  
Relative Humidity : Start record 53.6 %RH, Stop record 53.8 %RH

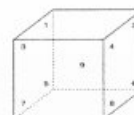
Calibration	Setting	Indicating	Measured	Measured	Overall
Temperature	Temperature	Temperature	Stability <sup>1</sup>	Uniformity <sup>2</sup>	Variation <sup>3</sup>
(°C)	(°C)	(°C)	(°C)	(°C)	(°C)
104	104	104	0.13	0.74	0.79

Without adjustment

Calibration	STD	STD	STD	STD	STD	STD	STD	STD	Uncertainty <sup>4</sup>
Temperature	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9
(°C)	(°C)	(°C)	(°C)	(°C)	(°C)	(°C)	(°C)	(°C)	(°C)
104	103.93	103.90	103.84	104.18	103.86	104.22	103.80	104.08	104.44

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. -



Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

### Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2206-272-0002 for Data Acquisition STD-286 Module 2 Serial No. MY44023139, Due 30-Dec-22

Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.

2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.

3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.

4. The uncertainty of measurement is included temperature stability.

5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

Page 2 of 3

Certificate No. : S2022100447-0003  
 Environment : Ambient Temperature : Start record 25.5 °C, Stop record 25.3 °C  
 Relative Humidity : Start record 53.6 %RH, Stop record 53.8 %RH

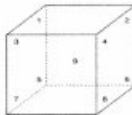
Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability <sup>1</sup> (°C)	Measured Uniformity <sup>2</sup> (°C)	Overall Variation <sup>3</sup> (°C)
180	180	180	0.20	0.97	1.46

Without adjustment

Calibration Temperature (°C)	STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)	STD No. 6 (°C)	STD No. 7 (°C)	STD No. 8 (°C)	STD No. 9 (°C)	Uncertainty <sup>4</sup> ±°C
180	180.47	180.28	180.34	180.28	179.95	179.40	179.91	179.51	179.67	1.1

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. -



Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2206-272-0002 for Data Acquisition STD-286 Module 2 Serial No. MY44023139, Due 30-Dec-22

Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.

2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.

3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.

4. The uncertainty of measurement is included temperature stability.

5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

End of Certificate

Page 3 of 3



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



## CALIBRATION CERTIFICATE

Certificate No. : S2022100447-0004

Date Issued : 02-Nov-22

Customer : Integrated Research Center Co., Ltd.  
 122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140

Equipment : Oven

Manufacturer : Binder

Model : ED 115

Serial No. : 20190000012946

ID No./Tag No. : -

Date Received : 31-Oct-22

Date Calibrated : 31-Oct-22

Calibrated by : Mr. Chanon Konyawong

Calibration Method or Calibration Procedure Used

Standard method : CP-05 TLAS G-20.

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

### Result of Calibration

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

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Approved by: *Sorayuth T.*  
 (Mr. Sorayuth Tochua)



Page 1 of 3

Certificate No. : S2022100447-0004  
 Environment : Ambient Temperature : Start record 25.5 °C, Stop record 25.3 °C  
 Relative Humidity : Start record 53.6 %RH, Stop record 53.8 %RH

Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability <sup>1</sup> (°C)	Measured Uniformity <sup>2</sup> (°C)	Overall Variation <sup>3</sup> (°C)
104	104	104	0.15	0.48	0.53

Without adjustment

Calibration Temperature (°C)	STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)	STD No. 6 (°C)	STD No. 7 (°C)	STD No. 8 (°C)	STD No. 9 (°C)	Uncertainty <sup>4</sup> ±°C
104	104.16	104.52	104.10	104.31	104.12	104.48	104.42	104.38	104.15	1.1

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. -



Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2206-272-0002 for Data Acquisition STD-286 Module 2 Serial No. MY44023139, Due 30-Dec-22

Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.

2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.

3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.

4. The uncertainty of measurement is included temperature stability.

5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

Page 2 of 3

Certificate No. : S2022100447-0004  
 Environment : Ambient Temperature : Start record 25.5 °C, Stop record 25.3 °C  
 Relative Humidity : Start record 53.6 %RH, Stop record 53.8 %RH

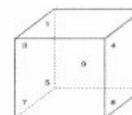
Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability <sup>1</sup> (°C)	Measured Uniformity <sup>2</sup> (°C)	Overall Variation <sup>3</sup> (°C)
180	180	180	0.39	0.66	1.02

Without adjustment

Calibration Temperature (°C)	STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)	STD No. 6 (°C)	STD No. 7 (°C)	STD No. 8 (°C)	STD No. 9 (°C)	Uncertainty <sup>4</sup> ±°C
180	180.68	180.42	180.27	180.34	180.01	180.21	180.25	180.25	180.25	1.2

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. -



Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2206-272-0002 for Data Acquisition STD-286 Module 2 Serial No. MY44023139, Due 30-Dec-22

Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.

2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.

3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.

4. The uncertainty of measurement is included temperature stability.

5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

End of Certificate

Page 3 of 3



## CALIBRATION CERTIFICATE

Certificate No. : S2022100447-0005  
Date Issued : 02-Nov-22

**Customer** : Integrated Research Center Co., Ltd.  
122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140

**Equipment** : Oven  
**Manufacturer** : Memmert  
**Model** : UF110  
**Serial No.** : B.417.1014  
**ID No./Tag No.** : DARC-TE17006  
**Date Received** : 31-Oct-22  
**Date Calibrated** : 31-Oct-22  
**Calibrated by** : Mr. Chanon Konyawong

**Calibration Method or Calibration Procedure Used**  
Standard method : CP-05 TLAS G-20.

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

### Result of Calibration

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

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

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



Page 1 of 3

Certificate No. : S2022100447-0005  
Environment : Ambient Temperature : Start record 25.6 °C, Stop record 25.3 °C  
Relative Humidity : Start record 53.4 %RH, Stop record 53.8 %RH

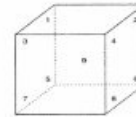
Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability <sup>1</sup> (°C)	Measured Uniformity <sup>2</sup> (°C)	Overall Variation <sup>3</sup> (°C)
104	104.0	104.0	0.20	0.58	0.91

Without adjustment

Calibration Temperature (°C)	STD	STD	STD	STD	STD	STD	STD	STD	STD	Uncertainty <sup>4</sup> ±°C
No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9		
104	104.03	103.71	104.21	103.81	103.95	104.05	103.82	104.26	104.19	0.99

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. -



Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

**Measurement Standards Used & Traceability :**

The International System of Units (SI) through

MIT Certificate No. AD2206-271-0002 for Temperature Indicator with Sensor Serial No. US37020317, Due 29-Dec-22

- Notes :
1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.
  2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.
  3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.
  4. The uncertainty of measurement is included temperature stability.
  5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

Page 2 of 3

Certificate No. : S2022100447-0005  
Environment : Ambient Temperature : Start record 25.6 °C, Stop record 25.3 °C  
Relative Humidity : Start record 53.4 %RH, Stop record 53.8 %RH

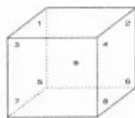
Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability <sup>1</sup> (°C)	Measured Uniformity <sup>2</sup> (°C)	Overall Variation <sup>3</sup> (°C)
180	180.0	180.0	0.24	0.51	1.07

Without adjustment

Calibration Temperature (°C)	STD	STD	STD	STD	STD	STD	STD	STD	STD	Uncertainty <sup>4</sup> ±°C
No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9		
180	180.56	180.05	180.65	180.15	180.20	180.63	180.08	180.74	180.41	1.1

Note : Probe No. 9 is Reference Probe

Setting Air Fresh No. -



Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

**Measurement Standards Used & Traceability :**

The International System of Units (SI) through

MIT Certificate No. AD2206-271-0002 for Temperature Indicator with Sensor Serial No. US37020317, Due 29-Dec-22

- Notes :
1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.
  2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.
  3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.
  4. The uncertainty of measurement is included temperature stability.
  5. The temperature uniformity, stability, overall variation and indicating temperature is applicable to all air or gas filled temperature controlled enclosures at atmospheric pressure.

End of Certificate

Page 3 of 3



## CALIBRATION CERTIFICATE

Certificate No. : S2022100447-0010  
Date Issued : 02-Nov-22

**Customer** : Integrated Research Center Co., Ltd.  
122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140

**Equipment** : Block Digestion for ICP  
**Manufacturer** : Environmental Express  
**Model** : SC1831  
**Serial No.** : 2021CPC-W256  
**ID No./Tag No.** : -  
**Date Received** : 31-Oct-22  
**Date Calibrated** : 31-Oct-22  
**Calibrated by** : Mr. Chanon Konyawong

**Calibration Method or Calibration Procedure Used**

In-house method : CP-49 base on TLAS G-20 by comparing against Standard Thermometer.

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

### Result of Calibration

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

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



Page 1 of 3

Certificate No. : S2022100447-0010

Environment : Ambient Temperature : Start record 25.7 °C, Stop record 25.4 °C  
Relative Humidity : Start record 53.5 %RH, Stop record 53.8 %RH

Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability <sup>1</sup> (°C)	Measured Uniformity <sup>2</sup> (°C)	Overall Variation <sup>3</sup> (°C)
95	95	95	0.41	2.25	2.06

Calibration Temperature (°C)	Standard Reading (°C), Probe No. 18 is Reference Probe					Uncertainty <sup>4</sup> (±°C)
95	No. 1	No. 2	No. 3	No. 4	No. 5	1.2
	94.60	94.38	94.64	94.67	94.68	
	No. 6	No. 7	No. 8	No. 9	No. 10	
	94.93	95.38	94.36	95.39	94.26	
	No. 11	No. 12	No. 13	No. 14	No. 15	
	94.94	94.43	94.73	94.40	94.83	
	No. 16	No. 17	No. 18	No. 19	No. 20	
	94.71	94.69	95.00	95.25	94.67	
	No. 21	No. 22	No. 23	No. 24	No. 25	
	95.03	94.92	95.28	94.95	95.22	
	No. 26	No. 27	No. 28	No. 29	No. 30	
	95.03	95.15	95.18	95.66	94.03	
	No. 31	No. 32	No. 33	No. 34	No. 35	
	94.96	95.20	95.29	95.09	95.04	

Without adjustment	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
	No. 8	No. 9	No. 10	No. 11	No. 12	No. 13	No. 14
	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21
	No. 22	No. 23	No. 24	No. 25	No. 26	No. 27	No. 28
	No. 29	No. 30	No. 31	No. 32	No. 33	No. 34	No. 35

Top view position

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2206-271-0001 for Temperature Indicator with Sensor Serial No. US37020317, Due 29-Dec-22

MIT Certificate No. AD2206-271-0002 for Temperature Indicator with Sensor Serial No. US37020317, Due 29-Dec-22

Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.

2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.

3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.

4. The uncertainty of measurement is included temperature stability.

Page 2 of 3

Certificate No. : S2022100447-0010

Environment : Ambient Temperature : Start record 25.7 °C, Stop record 25.4 °C  
Relative Humidity : Start record 53.5 %RH, Stop record 53.8 %RH

Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability <sup>1</sup> (°C)	Measured Uniformity <sup>2</sup> (°C)	Overall Variation <sup>3</sup> (°C)
105	105	105	0.41	9.94	2.09

Calibration Temperature (°C)	Standard Reading (°C), Probe No. 18 is Reference Probe					Uncertainty <sup>4</sup> (±°C)
105	No. 1	No. 2	No. 3	No. 4	No. 5	2.5
	104.95	104.66	104.92	104.96	104.96	
	No. 6	No. 7	No. 8	No. 9	No. 10	
	104.93	105.38	104.82	105.39	104.54	
	No. 11	No. 12	No. 13	No. 14	No. 15	
	104.94	104.92	104.72	104.69	104.84	
	No. 16	No. 17	No. 18	No. 19	No. 20	
	104.71	104.68	105.01	105.25	104.67	
	No. 21	No. 22	No. 23	No. 24	No. 25	
	105.06	104.94	105.30	104.97	105.24	
	No. 26	No. 27	No. 28	No. 29	No. 30	
	105.05	105.17	105.20	105.70	104.04	
	No. 31	No. 32	No. 33	No. 34	No. 35	
	105.08	104.84	105.48	105.05	105.00	

Without adjustment	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
	No. 8	No. 9	No. 10	No. 11	No. 12	No. 13	No. 14
	No. 15	No. 16	No. 17	No. 18	No. 19	No. 20	No. 21
	No. 22	No. 23	No. 24	No. 25	No. 26	No. 27	No. 28
	No. 29	No. 30	No. 31	No. 32	No. 33	No. 34	No. 35

Top view position

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2206-271-0001 for Temperature Indicator with Sensor Serial No. US37020317, Due 29-Dec-22

MIT Certificate No. AD2206-271-0002 for Temperature Indicator with Sensor Serial No. US37020317, Due 29-Dec-22

Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.

2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.

3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.

4. The uncertainty of measurement is included temperature stability.

End of Certificate

Page 3 of 3

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## CALIBRATION CERTIFICATE

Certificate No. : S2022100447-0008  
Date Issued : 02-Nov-22

Customer : Integrated Research Center Co., Ltd.  
122 Moo 2, Thatoom, Srimahaphote, Prachinburi 25140

Equipment : Cool room

Manufacturer : Dixell  
Model : XRO6CX-SNOC1  
Serial No. : LIOGBXB500  
ID No./Tag No. : DARC-TE15028  
Date Received : 31-Oct-22  
Date Calibrated : 31-Oct-22

Calibrated by : Mr. Chanon Konyawong

Calibration Method or Calibration Procedure Used

Standard method : CP-05 TLAS G-20.

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

### Result of Calibration

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

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



Page 1 of 2

Certificate No. : S2022100447-0008

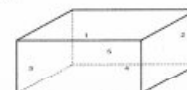
Environment : Ambient Temperature : Start record 25.5 °C, Stop record 25.8 °C  
Relative Humidity : Start record 53.6 %RH, Stop record 53.2 %RH

Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability <sup>1</sup> (°C)	Measured Uniformity <sup>2</sup> (°C)	Overall Variation <sup>3</sup> (°C)
4	4.0	4.0	1.52	1.11	3.03

Without adjustment

Calibration Temperature (°C)	STD No. 1 (°C)	STD No. 2 (°C)	STD No. 3 (°C)	STD No. 4 (°C)	STD No. 5 (°C)	Uncertainty <sup>4</sup> (°C)
4	4.11	4.14	4.60	4.22	4.47	1.8

Note : Probe No. 5 is Reference Probe



Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L20220995-004 for Digital Thermometer with Probe (Agilent) MI (166) Pt1000 Serial No. MY4600936, Due 11-Mar-23

Notes : 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.

2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.

3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.

4. The uncertainty of measurement is included temperature stability.

End of Certificate

Page 2 of 2



## CALIBRATION CERTIFICATE

Certificate No. : S2022100447-0006  
Date Issued : 02-Nov-22

**Customer** : Integrated Research Center Co., Ltd.  
122 Moo 2, Thatoom, Srirachaphote, Prachinburi 25140

**Equipment** : Thermometer standard

**Manufacturer** : -

**Model** : -

**Serial No.** : 19009

**ID No./Tag No.** : -

**Date Received** : 31-Oct-22

**Date Calibrated** : 31-Oct-22

**Calibrated by** : Mr. Chanon Konyawong

### Calibration Method or Calibration Procedure Used

In-house method : CP-136 by comparing against Standard Thermometer.

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

### Result of Calibration

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

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



Page 1 of 2

Certificate No. : S2022100447-0006

**Environment** : Ambient Temperature : Start record 26.8 °C, Stop record 26.9 °C  
Relative Humidity : Start record 53.1 %RH, Stop record 53.4 %RH

**Description of UUC** : Range : 0-250 °C  
Scale Division : 0.05 °C  
Resolution : 0.01 °C  
UUC Reference scale : 0 °C  
Measured Reference temperature : 0.005 °C  
Type : Total Immersion

STD Reading (°C)	Unit Under Calibration Reading (°C)	UUC Error (°C)	Measurement Uncertainty (±°C)
0.004	0.00	-0.004	0.28
50.001	50.00	-0.001	0.30
99.992	100.00	0.008	0.30

STD = Standard

UUC = Unit Under Calibration

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

**Measurement Standards Used & Traceability** :

The International System of Units (SI) through

MIT Certificate No. AD2206-242-0001 for Digital Thermometer with PRT Serial No. A87128, Due 08-Feb-23

End of Certificate

Page 2 of 2



## CALIBRATION CERTIFICATE

Certificate No. : S2022100447-0011  
Date Issued : 02-Nov-22

**Customer** : Integrated Research Center Co., Ltd.  
122 Moo 2, Thatoom, Srirachaphote, Prachinburi 25140

**Equipment** : Furnace

**Manufacturer** : CARBOLITE

**Model** : CWE 12/5

**Serial No.** : 296/521

**ID No./Tag No.** : -

**Date Received** : 31-Oct-22

**Date Calibrated** : 31-Oct-22

**Calibrated by** : Mr. Chanon Konyawong

### Calibration Method or Calibration Procedure Used

In-house method : CP-61 by comparison against Standard Thermometer.

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

### Result of Calibration

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

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



Page 1 of 2

Certificate No. : S2022100447-0011

**Environment** : Ambient Temperature : Start record 26.9 °C, Stop record 26.7 °C  
Relative Humidity : Start record 53.3 %RH, Stop record 53.1 %RH

UUC Setting (°C)	UUC Display Maximum (°C)	UUC Display Minimum (°C)	STD Reading Before Adjusted (°C)	STD Reading After Adjusted (°C)	Uncertainty (± °C)
550	550	550	549.2	550.5	3.4

STD = Standard

UUC = Unit Under Calibration

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

**Measurement Standards Used & Traceability** :

The International System of Units (SI) through

MIT Certificate No. L202209995-007 for Thermocouple Sensor (Type N) Serial No. 44703001/02-63, Due 01-Oct-23

MIT Certificate No. AD2204-089-0001 for Multifunction Calibrator (TRX-II) Serial No. 0468, Due 22-Apr-23

End of Certificate

Page 2 of 2



## CALIBRATION CERTIFICATE

Certificate No. : S2022100447-0012  
 Date Issued : 02-Nov-22

**Customer** : Integrated Research Center Co., Ltd.  
 122 Moo 2, Thathom, Srirachaphot, Prachinburi 25140

**Equipment** : Moisture analyzer

**Manufacturer** : Sartorius

**Model** : MA35

**Serial No.** : SWB26303311

**ID No./Tag No.** : -

**Date Received** : 31-Oct-22

**Date Calibrated** : 31-Oct-22

**Calibrated by** : Mr. Chanon Konyawong

### Calibration Method or Calibration Procedure Used

In-house method : CP-06 base on UKAS LAB 14 Edition 5 July 2015.

In-house method : CP-69 In-situ technique by comparing against Standard Thermometer.

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

### Result of Calibration

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

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Approved by:   
 ( Mr. Sarayuth Tochua )



Page 1 of 3

Certificate No. : S2022100447-0012

**Environment** : Ambient Temperature : Start record 25.9 °C , Stop record 25.6 °C  
 Relative Humidity : Start record 53.5 %RH , Stop record 53.4 %RH  
 Atmospheric Pressure : Start record 1008.4 mbar , Stop record 1008.5 mbar

Max. Capacity : 35 g Resolution : 0.001 g

### Departure from nominal value

Nominal Value (g)	Before Adjusted Correction (g)	After Adjusted Correction (g)	Uncertainty ± g
0.0 *	0.000	-	0.00082
3.5	0.000	-	0.00087
7.0	0.000	-	0.00083
10.5	0.000	-	0.00085
14.0	0.000	-	0.00084
17.5	0.000	-	0.00085
21.0	0.000	-	0.00084
24.5	0.000	-	0.00085
28.0	0.000	-	0.00087
31.5	0.000	-	0.00085
35.0	0.000	-	0.00086

Marked \* are not included in the NSC-ONSC accreditation schedule for our laboratory.

### Repeatability of reading

Load (g) : 35  
 Standard deviation (g) : 0.0000  
 Maximum difference (g) : 0.000  
 between successive reading

### Off-centre loading

Load (g) : 15  
 Position A (g) : 15.000  
 Position B (g) : 15.000  
 Position C (g) : 15.000  
 Position D (g) : 15.000  
 Position E (g) : 15.000  
 Maximum (g) : 0.000  
 difference



Front View

Condition As-Received: Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

### Measurement Standards Used & Traceability :

The International System of Units (SI) through

Calibratech Certificate No. 65-210275-1 for Weight Standard 6 kg (F1) Serial No. MIT-STD-20, Due 23-Jun-23

Page 2 of 3

Certificate No. : S2022100447-0012

### Temperature \*

Setting (°C)	Display Reading (°C)	Before Adjusted STD Reading (°C)	After Adjusted STD Reading (°C)	Error (°C)	Uncertainty (± °C)
75	75	75.3	-	-0.3	0.50
105	105	105.5	-	-0.5	0.50

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

### Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2203-426-0001 for Sound Level Meter (Temperature Measurement Function) Serial No. Q671506, Due 31-Mar-23

End of Certificate

Page 3 of 3

**METTLER TOLEDO**

Certificate Number CCP-2424-22

## Calibration Certificate Seven2Go™ Polarographic DO S4

### Customer

Company : Integrated Research Center Co., Ltd.  
 Address : 122, Moo 2, Tha Tum, Si Maha Phot  
 PRACHINBURI 25140  
 Customer ID number : 301604799  
 Service Assignment : 0332087026

### Instrument

Type : Seven2Go™ Polarographic DO S4 Instrument Serial Number : C196509714  
 Internal Identification : IFC-TE22501 Firmware version : 1.00

### Technical specifications

Measuring Range : 0.00 ... 99.9 mg/L (ppm) 0.0 ... 000 %  
 Resolution : 0.01 mg/L 0.1 %  
 Limit of Error : ± 0.2 mg/L in range 0 ... 15 ± 10 %  
 ± 10 % in range 15 ... 60

Temperature range ATC : 0 ... 60 °C Pressure range : 500 ... 1100 mbar  
 Resolution : 0.1 °C Resolution : 1 mbar  
 Limit of Error : ± 0.2 °C Limit of Error : ± 2 %

### Procedure Statement

METTLER TOLEDO Seven2Go Service Manual Section B (Doc. No. 20222219) will be used as referring documentation to adjust and certify the instrument indicated in the "Type" and "Serial number" section. The measurement results of this certification were obtained at ambient conditions.

Certificate Number CCP-2424-22

## Certification Tools

Certified digital voltmeter	Manufacturer Keysight Technologies	Serial number MY60035867
	Type 34401A	Certificate number ETU220683
		Date of Certification 05-May-22
DO Calibration Kit	Manufacturer METTLER-TOLEDO	Serial number G049
	Type 31302345	Certificate number 62617
		Date of Certification 12-Feb-22
DO resistors	Designation	Nominal value
	DO 10 MO	10.000 MO
	DO 1 MO	1.000 MO
Temperature resistors	Designation	Nominal value
	NTC 22 kΩ, 0 °C	65.180 kΩ
	NTC 22 kΩ, 25 °C	22.000 kΩ
Barometric pressure meter (Teato 511)	Manufacturer Teato Industrial Services GmbH	Serial number 39114205812
	Type 0560 0511	Certificate number 22P232
		Date of Certification 28-Jan-22

Certificate Number CCP-2424-22

## Certification Measurements

DO signal input	Designation	Theoretical current	Measured value	Max. Tolerance	Passed / Failed
	ETU22	-460 nA	-461.8 nA	10 nA	Passed
	10 MO	-46.049 nA	-45.870 nA	0.5 %	Passed
Temperature sensor input	Designation	Nominal value	Measured value	Max. Tolerance	Passed / Failed
	NTC 22 kΩ, 0 °C	0.0 °C	0.0 °C	0.2 °C	Passed
	NTC 22 kΩ, 25 °C	25.0 °C	25.0 °C	0.2 °C	Passed
Barometric pressure input	Designation	Measured value	Measured value	Max. Tolerance	Passed / Failed
	Ambient pressure	1008.9 mbar	1008 mbar	2 %	Passed

## Summary of Certification

Certification of instrument **Passed**

The instrument referred to in this certificate has fulfilled the criteria of the certification. This is indicated by the notation Passed in the column above.

Remarks

Certification of the instrument was performed by

Name Khomsan Prataung Function Service Engineer  
Company Mettler-Toledo (Thailand) Ltd.  
Date 29-Oct-2022 Signature

Mettler-Toledo (Thailand) Limited

METTLER TOLEDO

## Performance Test

Attachment to Certificate No. CCE-2424-22

## DO Sensor

Type: Inlab 605-ISM S/N: 1471235

## Measurement

Test	Measurement Probe	
	Before Adjustment	After Adjustment
Air	115.3%	100.0%
Pressure	1008 mbar	1008 mbar
Temperature	28.1	29.0

## Remarks:

Place: Laboratory Calibration Date: 29-Oct-2022  
Service Specialist: Khomsan Prataung Signature:



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## CALIBRATION CERTIFICATE

Certificate No.: S2022110134-0001

Date Issued: 18-Nov-22

Customer: Integrated Research Center Co., Ltd.  
122 Moo 2, Thathoom, Srirachaphote, Prachinburi 25140

Equipment: Block Digestion Unit

Manufacturer: Gerhardt  
Model: KT 20S  
Serial No.: 5720190108  
ID No./Tag No.: -  
Date Received: 17-Nov-22  
Date Calibrated: 17-Nov-22

Calibrated by: Mr. Chanon Konyawong

## Calibration Method or Calibration Procedure Used

In-house method: CP-49 base on TLAS G-20 by comparing against Standard Thermometer.

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

## Result of Calibration

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

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



Certificate No.: S2022110134-0001

Environment: Ambient Temperature: Start record 26.5 °C, Stop record 26.4 °C  
Relative Humidity: Start record 53.4 %RH, Stop record 53.6 %RH

Calibration Temperature (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Stability <sup>1</sup> (°C)	Measured Uniformity <sup>2</sup> (°C)	Overall Variation <sup>3</sup> (°C)
380	380	380	0.33	1.53	1.70

Calibration Temperature (°C)	Standard Reading (°C), Probe No. 8 is Reference Probe					Uncertainty <sup>4</sup> (±°C)
380	No. 1	No. 2	No. 3	No. 4	No. 5	1.5
	379.74	380.96	379.62	379.85	380.41	
	No. 6	No. 7	No. 8	No. 9	No. 10	
	380.47	380.49	379.82	380.22	380.32	
	No. 11	No. 12	No. 13	No. 14	No. 15	
	379.63	380.86	379.52	379.74	380.50	
	No. 16	No. 17	No. 18	No. 19	No. 20	
	380.36	380.38	379.71	380.12	380.22	

Without adjustment

No. 1	No. 6	No. 11	No. 16
No. 2	No. 7	No. 12	No. 17
No. 3	No. 8	No. 13	No. 18
No. 4	No. 9	No. 14	No. 19
No. 5	No. 10	No. 15	No. 20

Top view position

Condition As-Received: Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability:

The International System of Units (SI) through

MIT Certificate No. L202208263-002 for Digital Thermometer with Probe (Agilent) Module 2 (172) Type K Serial No. US37011204, Due 11-Mar-23

- Notes: 1. The temperature stability is the one-half of greatest maximum difference of measured temperatures at any one probe.  
2. The temperature uniformity is the maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time.  
3. Overall variation is the difference of maximum and minimum measured temperatures throughout observation time.  
4. The uncertainty of measurement is included temperature stability.

End of Certificate

Page 2 of 2



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## CALIBRATION CERTIFICATE

Certificate No.: L202211020-004  
Date Issued: 08-Nov-22

Customer: Integrated Research Center Co., Ltd.  
122 Moo 2, Thatoon, Srirachaphote, Prachinburi 25140

Equipment: Digital Thermo - Hygrometer

Manufacturer: Thermopro

Model: TP55

Serial No.:

ID No./Tag No.: WL-2022/02

Date Received: 02-Nov-22

Date Calibrated: 04-Nov-22

Calibrated by: Mr. Apiwat Peanrungrat

Calibration Method or Calibration Procedure Used

In-house method: CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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

### Result of Calibration

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

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



Page 1 of 2

Certificate No.: L202211020-004

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

Function: Temperature Measurement Humidity Control: (50 ± 15) %RH

STD Reading (°C)	UUC Reading (°C)	UUC Error (°C)	Measurement Uncertainty (±°C)
19.99	20.5	0.51	0.35
24.99	25.3	0.31	0.35

Function: Humidity Measurement Temperature Control: (25 ± 5) °C

STD Reading (%RH)	UUC Reading (%RH)	UUC Error (%RH)	Measurement Uncertainty (±%RH)
29.99	31	1.01	2.5
49.99	51	1.01	2.5
69.98	69	-0.98	2.5

STD = Standard

UUC = Unit Under Calibration

Description of UUC: Range (-50) to 70 °C Internal Sensor / 10 to 99 %RH  
Resolution 0.1 °C / 1 %RH

Condition As-Received: Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability:

The International System of Units (SI) through

MIT Certificate No. AD2111-077-0001 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 11-Nov-22

MIT Certificate No. AD2205-305-0001 for Humidity/Temperature Transmitter Serial No. C4240013, Due 04-Jun-23

End of Certificate

Page 2 of 2



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## CALIBRATION CERTIFICATE

Certificate No.: L202211020-003  
Date Issued: 08-Nov-22

Customer: Integrated Research Center Co., Ltd.  
122 Moo 2, Thatoon, Srirachaphote, Prachinburi 25140

Equipment: Digital Thermo - Hygrometer

Manufacturer: Thermopro

Model: TP55

Serial No.:

ID No./Tag No.: WL-2022/01

Date Received: 02-Nov-22

Date Calibrated: 04-Nov-22

Calibrated by: Mr. Apiwat Peanrungrat

Calibration Method or Calibration Procedure Used

In-house method: CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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

### Result of Calibration

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

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



Page 1 of 2



Certificate No. : L202211020-003  
Environment : Ambient Temperature : (25 ± 2) °C  
Relative Humidity : (50 ± 15)%RH

Function : Temperature Measurement		Humidity Control : (50 ± 15) %RH	
STD	UUC Reading	UUC Error	Measurement
Reading (°C)	(°C)	(°C)	Uncertainty (±°C)
19.99	20.3	0.31	0.35
24.99	25.2	0.21	0.35

Function : Humidity Measurement		Temperature Control : (25 ± 5)°C	
STD	UUC Reading	UUC Error	Measurement
Reading (%RH)	(%RH)	(%RH)	Uncertainty (±%RH)
29.99	32	2.01	2.5
49.99	52	2.01	2.5
69.98	72	2.02	2.5

STD = Standard

UUC = Unit Under Calibration

Description of UUC :	Range	(-50) to 70 °C Internal Sensor /	10 to 99 %RH
	Resolution	0.1 °C /	1 %RH

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. AD2111-077-0001 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 11-Nov-22

MIT Certificate No. AD2205-305-0001 for Humidity/Temperature Transmitter Serial No. C4240013, Due 04-Jun-23

End of Certificate

บริษัท ยูไนเท็ด แอนนาลิสต์ แอนด์ เอ็นจิเนียริง  
คอนซัลแตนท์ จำกัด

รายการใบรับรองสอบเทียบ/ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับวิเคราะห์คุณภาพน้ำทิ้ง

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์									
1	Digester Unit	Total Kjeldahl Nitrogen (TKN)	FOSS TECATOR	2520auto / 91794469	National Food Institute, Ministry of Industry, Thailand	2302413-001-01	30 Mar 23	28 Mar 24	-
2	Distillation Unit (Kjeldahl Method)	Total Kjeldahl Nitrogen (TKN) Ammonia	FOSS TECATOR	KT200 / 91790524	FOSS South East Asia	5874	30 Nov 21	29 Nov 22	-
3	Incubator	Fecal Coliform Bacteria Total Coliform Bacteria	Memmert	IPP 260 / V616.0066	Technology Promotion Association (Thailand-Japan)	23TM728	27 Apr 23	25 Apr 24	
4	Incubator		Memmert	IPP 260 / V615.0187	Technology Promotion Association (Thailand-Japan)	23TM378	12 Apr 23	10 Apr 24	-
5	Water Bath		Memmert	WNE 14 / L416.0606	Technology Promotion Association (Thailand-Japan)	23TM193	15 Feb 23	14 Feb 24	-
6	Water Bath		Memmert	WNE 14 / L414.1407	Technology Promotion Association (Thailand-Japan)	23TM374	11 Apr 23	9 Apr 24	-
7	Analytical Balance		OHAUS	PX623 / C236754745	DKSH (Thailand) Ltd.	C01223732	9 Dec 22	8 Dec 23	-
8	Auto Clave		ALP	CL-40L / 808763	Technology Promotion Association (Thailand-Japan)	23TM763	27 Apr 23	25 Apr 24	-

Due Date of Calibration\* : Based on the annual calibration plan. At least 1 time per year.

## Verification Certificate

Certificate No.: 2202361-001-01  
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.  
Address: 3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: HEATING BLOCK DIGESTION

Manufacturer: FOSS

Model: 2520

Serial No.: 91794469

ID No.: UAE.WAS.011/2560

Order No.: 2202361

Operation No.: 2202361-001

Date of Receipt: 4 April 2022

Date of Calibration: 4-6 April 2022

Calibrated by Mr.Nuttapol Niyomchat  
SpecialistApproved by (Mr.Pheraphat Tuanjit)  
Manager, Division of Calibration Laboratory  
Responsible for the Technical Management Team

Date of Issue: 11 April 2022

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

## Verification Report

Certificate No.: 2202361-001-01  
Equipment: HEATING BLOCK DIGESTION  
Model: 2520 Serial No.: 91794469  
Resolution: 1 °C ID No.: UAE.WAS.011/2560  
Manufacturer: FOSS

Date of Calibration: 4-6 April 2022

Page 2 of 4

Location: Laboratory Room, NATIONAL FOOD INSTITUTE  
Environment Condition: Ambient Temperature ( 25 ± 3 ) °C  
Relative Humidity ( 55 ± 15 ) %  
Line Voltage ( 220 ± 10 ) Volt

## Condition of this results of Calibration:

- This instrument was calibrated by insert standard thermocouples type R into its heating block digestion and compared to temperature obtained from reference standards thermometer at calibrated point.
- The temperature scale used was based on ITS - 90 .
- All data show below were final values and the initial data may be obtained upon request.

## 2. Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with Thermocouple	34970A/34901A	MY404055761/MY41104483	TC21/0041	24-Apr-2022	N.M. Technical Center Laboratory
	Type R	TC985-102 / CH101-103			

- This certificate is traceable to international system of units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good

UUC\* Description  
Time of Record : Hour 30 Minute At 380 °C

7. Result of Calibration : ☒ Without adjustment ☐ After adjustment

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

## Verification Report

Certificate No.: 2202361-001-01  
Equipment: HEATING BLOCK DIGESTION  
Model: 2520 Serial No.: 91794469  
Resolution: 1 °C ID No.: UAE.WAS.011/2560  
Manufacturer: FOSS

Date of Calibration: 4-6 April 2022

Page 3 of 4

Calibration point: 380 °C

## Calibration result:

## Reporting of Temperature

Block No.	UUC* Setting (°C)	UUC* Reading (°C)	Stability (±°C)	Standard Thermometer (°C)	Uncertainty (±°C)
1	380	380	0.13	376.48	1.5
2	380	380	0.12	376.58	1.5
3	380	380	0.12	376.51	1.5
4	380	380	0.14	376.70	1.6
5	380	380	0.18	376.81	1.6
6	380	380	0.12	377.23	1.6
7	380	380	0.12	377.37	1.5
8	380	380	0.13	376.68	1.5
9	380	380	0.14	376.72	1.5
10	380	380	0.18	378.97	1.6
11	380	380	0.25	378.79	1.6
12	380	380	0.11	377.14	1.6
13	380	380	0.19	379.65	1.6
14	380	380	0.16	379.61	1.6
15	380	380	0.16	378.66	1.6
16	380	380	0.15	379.18	1.6
17	380	380	0.23	377.39	1.6
18	380	380	0.11	377.71	1.6
19	380	380	0.22	376.64	1.6
20	380	380	0.16	376.56	1.6

## Note:

- UUC\* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

## Verification Report

Certificate No.: 2202361-001-01  
Equipment: HEATING BLOCK DIGESTION  
Model: 2520 Serial No.: 91794469  
Resolution: 1 °C ID No.: UAE.WAS.011/2560  
Manufacturer: FOSS

Date of Calibration: 4-6 April 2022

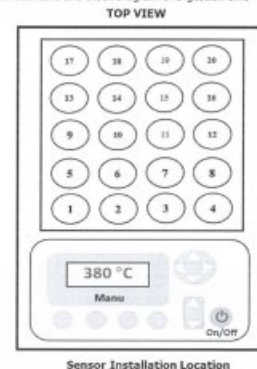
Page 4 of 4

Calibration point: 380 °C

## Calibration result:

Continued

Figure 1. Location of Reference Standard and Block Diagram of Digestion Unit



Sensor Installation Location

## Note:

- UUC\* = Unit Under Calibration
- Immersion depth of standard thermometer in tube level high of sand is equal heater plate of UUC.
- Stability = One-half of the greatest maximum difference of measured temperatures at one sensors, for at least half an hour after reaching steady state.

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

----- End -----

F-CS-012 Revision: 00 Date: 14-12-61

เอกสารไม่ควบคุม

Report No: 5874

Date: 30/11/21  
Customer: UAE  
Instrument: KT 200Address: 91 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10110  
Serial: 91790529

Hours	Travel To Customer	Labour	Travel From Customer
Start	8.00	9.00	16.00
Finish	8.00	14.00	15.00

Application		Special		Job Type		Standard	
Normal	<input checked="" type="checkbox"/>	Courtesy Visit	<input checked="" type="checkbox"/>	Installation	<input checked="" type="checkbox"/>	Training	<input checked="" type="checkbox"/>
Distributor	<input checked="" type="checkbox"/>	PMA Onboarding	<input checked="" type="checkbox"/>	Quote	<input checked="" type="checkbox"/>	In House	<input checked="" type="checkbox"/>
Internal	<input checked="" type="checkbox"/>	Warranty	<input checked="" type="checkbox"/>	Repair	<input checked="" type="checkbox"/>	PM	<input checked="" type="checkbox"/>
Digital Service	<input checked="" type="checkbox"/>	Sales Support	<input checked="" type="checkbox"/>	Remote	<input checked="" type="checkbox"/>	Other	<input checked="" type="checkbox"/>

PO/Quote Number:

PMA Type: FOSS CARE - PCD Contract No.

Details of Work / Test	Condition / Status
- Check Instrument	Pass
- Check PM kit for KT 200	Pass
- Check Safety Valve	Pass
- Check Rubber Gasket	Pass
- Check Heating element	Pass
- Check New panel PCB	Pass
- Check Safety door	Pass
- Clean Lubricant	Pass
- Check Temperature	Pass
- Check Valve setting set 20ml for 20ml	Pass

Part No.	Batch	Description	Qty
10009445	11255 983	FOSS PM KIT KT 200	1
15250229	20-07-21	Safety Valve	1
15250229	20-07-21	Rubber Gasket for Heating coil	2
10009445	11255 983	Heating Element	1
10009445	11255 983	Seal	1
10009445	11255 983	KT 200 new panel PCB	1
10009445	11255 983	Safety door complete	1

I confirm this report is accurate and complete

Signed FOSS:  Signed Customer:

Name:  Name:

Would you be willing to participate in a brief survey in order to tell us how we performed?

เอกสารไม่ควบคุม

Customer: UAE

Instrument	Kjeltec™ 2100 - 400/tec 200
Recommended PM interval (whichever occurs first between interval and no. of samples analysed)	12 months No. of samples analysed (if applicable)
Preventive maintenance kit (P/N)	10009965 C/N 91790529

## Introduction

A maintenance protocol provides systematic and functional means of maintaining a specific instrument type. The recommended PM interval depends on the operational conditions and is based on our extensive experience and knowledge of manufacturing and maintaining analytical instruments.

Apart from sample throughput, the environmental conditions also need to be considered. A demanding environment, such as high ambient temperature, humidity, dirtiness etc can measurably shorten component lifetime and also the maintenance and component replacement intervals.

## NOTE:

The content of this protocol is subject to change over time. In order to safeguard that you obtain the correct parts, please make sure to indicate serial no and date of installation when contacting your FOSS representative.

## Dedicated Analytical Solutions

FOSS Analytical AS  
65 Slangerupgade  
516-5000 Hinnerup  
Denmark

Tel +45 7010 3370  
Fax +45 7010 3371  
E-mail support@foss.dk  
Web www.foss.dk

FOSS Analytical AB  
Box 70  
SE-281 21 Ingemar  
Sweden

Tel +46 42 361500  
Fax +46 42 340349  
E-mail support@foss.se  
Web www.foss.se

Customer Support, 1001 4572 / Rev. 3

(10)

เอกสารไม่ควบคุม

## Maintenance Procedure

## Exchange of Parts and Cleaning

Step	Action	Part	P/N	OK
1	Replace	Adapter for dig. tube 250 ml	1000 0056	<input type="checkbox"/>
2	Replace	Non return valve	1000 3538	<input type="checkbox"/>
3	Replace valves in alkali pump	Valve kit reagent/water pump	1575 0093	<input type="checkbox"/>
4	Replace steam tubing	Silicone tubing 8/12 mm	1582 0006	<input type="checkbox"/>
5	Replace alkali tubing	Tubing reinforced for alkali	1582 0011	<input type="checkbox"/>
6	Replace water tubing	Tubing PVC 8/11 mm	1582 0004	<input type="checkbox"/>
7	Cleaning	Steam generator		<input type="checkbox"/>
8	Cleaning	Splash head		<input type="checkbox"/>

## Check and Adjustments

Step	Action	Module	Measured	Limits	OK
1	Check alkali volume, 10 ml/stroke	Alkali pump	98	At 50 ml -0/+3 ml	<input checked="" type="checkbox"/>
2	Check distillation volume		120ml	100 - 150 ml/4 min	<input checked="" type="checkbox"/>
3	Check front panel switches				<input checked="" type="checkbox"/>
4	Check cables and electrical connections				<input checked="" type="checkbox"/>
5	Check level pins in steam generator				<input checked="" type="checkbox"/>
6	Check safety door switch				<input checked="" type="checkbox"/>

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
5344 PATTANAKARN ROAD 901 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL: 0-2717-3000-29 FAX: 0-2719-9484



Cert. No.: 23TM728  
Page: 1 of 3

## Certificate of Calibration

Equipment: Incubator

Manufacturer: Memmert

Model: IPP 260

Serial No.: V616.0066

ID No.: UAE.MIC.032/2559

Submitted by: United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260

Location: Microbiology Laboratory (302)

Received Order: 27 April 2023  
Calibration Date: 27 - 28 April 2023  
Ambient Temperature: (28 ± 10) °C  
Relative Humidity: (50 ± 30) %

Calibrated by: Tawatchai Pama

Approved by:   
Approved Signatory

( ) Pornthippa Tameyakul  
( ) Malee Butkrues  
( ) Suwit Injai

Issue Date: 11 May 2023

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม





Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2304-0461OC-6  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 23TM728  
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
25.0	25.0	25.0	0.020	0.81	1.2	2
36.0	36.0	36.0	0.15	1.1	1.6	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
25.0	25.541	25.354	25.388	25.278	24.341	24.349	24.379	24.455	24.747	0.30
36.0	35.275	35.351	35.768	35.941	36.543	36.590	36.653	36.728	36.232	0.39

Average\* : The average of 30 values in each position.  
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.  
Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.  
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.  
UUC\* : Unit Under Calibration  
Note : The reported uncertainty of measurement was included stability and excluded uniformity .  
The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k, providing a level of confidence of approximately 95 %.

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เอกสารไม่ควบคุม



Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2304-0461OC-6  
Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ).  
The temperature scale used was based on ITS-90.

#### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34972A	MY57013711	22LM93	02 Jul 2023

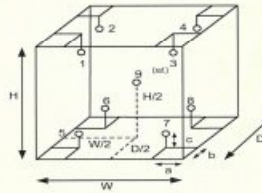
2. This certificate is valid only to the item calibrated on date and place of calibration.  
3. This certification is traceable to the International System of Unit.

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	25	22
REL Humid. ( % )	76	83
AC Supply ( Volt )	231	231



#### Probe Installation Details :

a =	10	cm
b =	10	cm
c =	10	cm

#### Dimension of Chamber :

D =	0.50	m
W =	0.64	m
H =	0.80	m
Capacity =	0.26	m <sup>3</sup>

Position :	Ref. Std. ID No.:
1	22-18RTD-2/1
2	18RTD-2/2
3	18RTD-2/3
4	18RTD-2/4
5	18RTD-2/5
6	18RTD-2/6
7	18RTD-2/7
8	18RTD-2/8
9 (ref.)	18RTD-2/9

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
534-4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK, 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM378  
Page : 1 of 3

## Certificate of Calibration

Equipment : Incubator  
Manufacturer : Memmert  
Model : IPP 260  
Serial No. : V615.0187  
ID No. : UAE.MIC.003/2559  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
Location : Microbiology Laboratory  
Received Order : 11 April 2023  
Calibration Date : 12 April 2023  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
Calibrated by : Preecha Hlahib  
Approved by :   
( ) Pornthippa Tameysakul  
( ) Malee Butkruea  
( ) Suwit Imjai  
Issue Date : 24 April 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

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Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2304-0155OC-1  
Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector ( RTD ).  
The temperature scale used was based on ITS-90.

#### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34972A	MY49001451	23LM27	25 Feb 2024

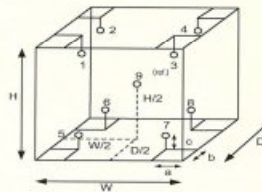
2. This certificate is valid only to the item calibrated on date and place of calibration.  
3. This certification is traceable to the International System of Unit.

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Fresh air setting : Not Available

Environment during calibration		
	Beginning	Finished
Temp. ( °C )	25	26
REL Humid. ( % )	57	61
AC Supply ( Volt )	220	220



#### Probe Installation Details :

a =	5.0	cm
b =	5.0	cm
c =	5.0	cm

#### Dimension of Chamber :

D =	0.50	m
W =	0.64	m
H =	0.80	m
Capacity =	0.26	m <sup>3</sup>

Position :	Ref. Std. ID No.:
1	19RTD-2/1
2	19RTD-2/2
3	19RTD-2/3
4	19RTD-2/4
5	19RTD-2/5
6	19RTD-2/6
7	19RTD-2/7
8	19RTD-2/8
9 (ref.)	19RTD-2/9

เอกสารไม่ควบคุม



Equipment : Incubator  
Condition As-Received : Used Item  
Reference : 2304-0155OC-1  
Result of Calibration : ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Not Available

Cert. No.: 23TM378  
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
35.0	35.0	35.0	0.052	0.53	0.60	2

Calibration Point ( °C )	Measured Temperature ( °C )									Uncertainty  ( ± °C )
	Position									
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.092	35.148	34.817	35.149	34.894	35.323	34.773	35.058	34.802	0.30

Average\* : The average of 30 values in each position.  
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.  
Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.  
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.  
UUC\* : Unit Under Calibration  
Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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

-o0o-

เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
5544 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM193  
Page : 1 of 3

## Certificate of Calibration

Equipment : Water Bath  
Manufacturer : Memmert  
Model : WNE 14  
Serial No. : L416.0606  
ID No. : UAE.MIC.002/2560  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhenong,  
Bangkok 10260  
Location : Microbiology Laboratory  
Received Order : 15 February 2023  
Calibration Date : 15 February 2023  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %

Calibrated by : Suwit Imjai

Approved by :   
Approved Signatory

( ) Pornthippa Tameyakul  
( / ) Mailee Bulkruea

Issue Date : 24 February 2023

The Uncertainties are for a confidence probability of approximately 95%

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Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2302-0295OC-2

Cert. No.: 23TM193  
Page : 2 of 3

Procedure Used :-  
Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer ( IPRT ).

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

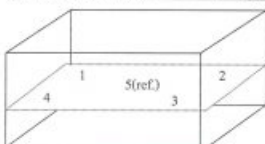
- Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34972A	MY59003411	22LM165	26 Nov 2023
- This certificate is valid only to the item calibrated on date and place of calibration.
- This certification is traceable to the International System of Unit.

Result of Calibration : ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	22	65	231
Finished of Calibration	23	61	231



Front

Position :	Ref. Std. ID No.:
1	4804539-001
2	4804539-002
3	4804539-003
4	4804539-004
5(ref.)	4804539-005

เอกสารไม่ควบคุม



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2302-0295OC-2  
Result of Calibration : ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 23TM193  
Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.453	44.437	44.428	44.477	44.459

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor k
44.5	0.079	0.036	0.15	2

Average\* : The average of 30 values in each position.  
Uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.  
Stability : One-half of the greatest maximum difference of measured temperature at any one probe.  
UUC\* : Unit Under Calibration  
Note : The reported uncertainty of measurement was included stability and excluded uniformity.

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-29 FAX. 0-2719-0484



Cert. No.: 23TM374  
Page : 1 of 3

## Certificate of Calibration

Equipment : Water Bath  
Manufacturer : Memmert  
Model : WNE 14  
Serial No. : L414.1407  
ID No. : UAE.MIC.006/2558  
Submitted by : United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
Location : Microbiology Laboratory  
Received Order : 11 April 2023  
Calibration Date : 11 April 2023  
Ambient Temperature : (26 ± 10) °C  
Relative Humidity : (50 ± 30) %

Calibrated by : Krisda Maloe

Approved by :   
Approved Signatory

( ) Pongthipha Tameyaykul  
( ) Maloe Butkrua  
( ) Suwit Imjai

Issue Date : 24 April 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services : Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2304-0155OC-3  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 23TM374  
Page : 3 of 3

Calibration point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Average* Standard Reading ( °C )					Uncertainty ( ± °C )
			Position					
			1	2	3	4	5 (ref.)	
44.5	44.5	44.5	44.508	44.466	44.456	44.478	44.483	0.15

Calibration point ( °C )	Uniformity ( °C )	Stability ( ± °C )	Coverage Factor k
44.5	0.065	0.031	2

Average\* : The average of 30 values in each position.

Uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC\* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

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

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เอกสารไม่ควบคุม

๑ 115๑7๕๑



Equipment : Water Bath  
Condition As-Received : Used Item  
Reference : 2304-0155OC-3  
Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT04 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34972A	MY59003411	22LM165	26 Nov 2023

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

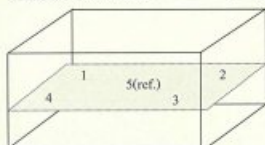
3. This certification is traceable to the International System of Unit.

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	26	55	220
Finished of Calibration	25	56	221



Front

Position :	Ref. Std. ID No.:
1	4804539-001
2	4804539-002
3	4804539-003
4	4804539-004
5(ref.)	4804539-005

เอกสารไม่ควบคุม

๑ 115๑7๕๑



## Certificate of Calibration

Equipment : Balance  
Model : PX623  
Serial No. (or ID.): C236754745  
Manufacturer : Ohaus  
Condition : New

Certificate No.: C01223732  
Issued Date: 09 December 2022  
Job No.: KSPR2215576  
Page: 1 of 2

Customer : United Analyst and Engineering Consultant Co., Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak Sub-District,  
Phrakhanong District, Bangkok, THAILAND 10260

Environment Condition : Temperature 26 °C ± 0.5 °C  
Humidity 53 %RH ± 3.9 %RH

Calibration Place : United Analyst and Engineering Consultant Co., Ltd. (301 Microbiology Room)  
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak Sub-District,  
Phrakhanong District, Bangkok, THAILAND 10260

Calibration By : Mr. Adisai Maknoi  
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. C022217605

(Mr. Adisai Maknoi)  
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 in the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ( $k=2$ ) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).  
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

บริษัท ดีเคเอส เทคโนโลยี จำกัด  
DKSH Technology Limited  
2533 หมู่ 10 ถนนสุขุมวิท แขวงคลองเตย เขตวัฒนา กรุงเทพมหานคร 10260  
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260  
Phone: +66 2630 7000 Email: info.calibration@dksh.com Website: www.dksh.com/certificate-thailand  
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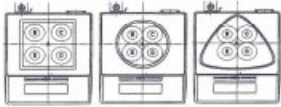
CAL-FM-C01-14: 12 Sep 2022



### Calibration Results:

#### Without 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		200			(g)
Reference Points (g)					
A	B	C	D	E	
-	0.000	0.000	0.000	0.000	

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.001 (g)

Nominal test value (g)	Standard Deviation
50	0.0004
500	0.0005

Error of indication from nominal or conventional mass value., Readability 0.001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
1	1.0000	1.000	0.000	0.0010	2.03
5	5.0001	5.000	0.000	0.0010	2.03
10	10.0001	10.000	0.000	0.0010	2.03
20	20.0001	20.000	0.000	0.0010	2.03
50	50.0001	50.000	0.000	0.0010	2.03
100	100.0001	100.000	0.000	0.0011	2.03
200	200.0004	200.000	0.000	0.0011	2.02
300	300.0005	300.000	-0.001	0.0013	2.01
400	400.0008	400.001	0.000	0.0014	2.01
500	500.0003	500.000	0.000	0.0017	2.00
600	600.0004	600.000	0.000	0.0019	2.00

The End of Certificate

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### 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 error 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, UKAS Lab14. 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 Single Acceptance Rule ( $w = 0$ ), Specific Risk < 50% PFA
- ☒ Choice B Non-binary statement with guard band ( $w = 1 U$ ), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% 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

*Rungrod*

(Mr. Rungrod Jenkitrakulchai)

Authorized signatory

เอกสารไม่ควบคุม

### Statements of conformity:

#### Without Adjustment

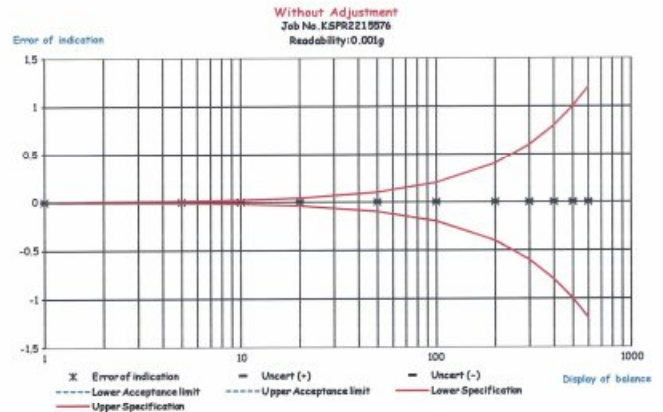
Readability: 0.001 g

Nominal Value (g)	Error of Indication (g)	Guard band (w) (g)	Tolerance (±) (g)	Conformity
1	0.000	0.0010	0.002	Pass
5	0.000	0.0010	0.010	Pass
10	0.000	0.0010	0.020	Pass
20	0.000	0.0010	0.040	Pass
50	0.000	0.0010	0.100	Pass
100	0.000	0.0011	0.200	Pass
200	0.000	0.0011	0.400	Pass
300	-0.001	0.0013	0.600	Pass
400	0.000	0.0014	0.800	Pass
500	0.000	0.0017	1.000	Pass
600	0.000	0.0019	1.200	Pass

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

เอกสารไม่ควบคุม



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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2713-3000-29 FAX. 0-2719-9484



Cert. No.: 23TM763  
Page : 1 of 3

## Certificate of Calibration

Equipment : Autoclave  
Manufacturer : ALP  
Model : CL-40L  
Serial No. : 808763  
ID No. : UAE.MIC.026/2563  
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.  
3 Soi Udomsuk 41, Sukhumvit Road,  
Bangchak, Phrakhanong,  
Bangkok 10260  
Location : Microbiology Laboratory (301)  
Received Order : 27 April 2023  
Calibration Date : 27 April 2023  
Ambient Temperature : ( 26 ± 10 ) °C  
Relative Humidity : ( 50 ± 30 ) %  
Calibrated by : Preecha Hiahib  
Approved by :   
( ) Pornthipha Tameyakul  
(✓) Malee Butkruea  
( ) Suwit Imjai  
Issue Date : 11 May 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม

A 0053944



Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2304-0461OC-2  
Procedure Used :-

Cert. No.: 23TM763  
Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT03 according to direct measurement method with Data Acquisition which connected with Thermocouple Type T  
The temperature scale used was based on ITS-90.

### Condition of this result of calibration

#### 1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1 ) Data Acquisition	34972A	MY59003411	22LM165	26 Nov 2023

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

3. This certification is traceable to the International System of Unit.

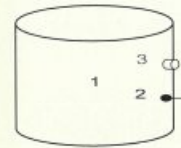
4. This result of calibration covers laboratory autoclaves for the sterilization of goods and material which could be infected with organisms categorized as Hazard Group 1, 2 and 3\*\*

(\*\* = Categorization of pathogens according to hazard and categories of containment, second edition, 1990 )  
It does not cover autoclaves for use with material infect with organisms in Hazard Group 4, for which complete containment and sterilization of infected condensate is considered to be essential.

This result of calibration does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical or veterinary purposes which are directly concerned with patient care, or those used for fabrics subjected to sterilization which are required to be dry at the end of cycle.

Result of Calibration :- ( \* ) Without Adjustment

Function of UUC\* : Temperature Source



	Environmental		
	( °C )	( %R.H. )	( Volt )
Beginning of Calibration	27	60	220
Finished of Calibration	27	58	220

Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	18-20TC-04
2 =	Temperature sensor	18-20TC-05
3 =	Exhaust port	18-20TC-06

เอกสารไม่ควบคุม

a 1159968



Equipment : Autoclave  
Condition As-Received : Used Item  
Reference : 2304-0461OC-2  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source

Cert. No.: 23TM763  
Page : 3 of 3

Operating parameter Set : Temperature = 115.0 °C  
Sterilization period = 15 minute

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Average* Standard Reading ( °C )	Stability ( ± °C )	Pressure Reading ( MPa )	Uncertainty ( ± °C )	Coverage Factor k
115.0	115.0	1	115.213	0.22	0.08	0.75	2
		2	115.166				
		3	115.260				

Operating parameter Set : Temperature = 121.0 °C  
Sterilization period = 30 minute

UUC* Setting ( °C )	UUC* Reading ( °C )	Position	Average* Standard Reading ( °C )	Stability ( ± °C )	Pressure Reading ( MPa )	Uncertainty ( ± °C )	Coverage Factor k
121.0	121.0	1	121.260	0.29	1.1	0.75	2
		2	121.224				
		3	121.284				

Average\* : The average of 30 values in each position.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC\* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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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a 1159967