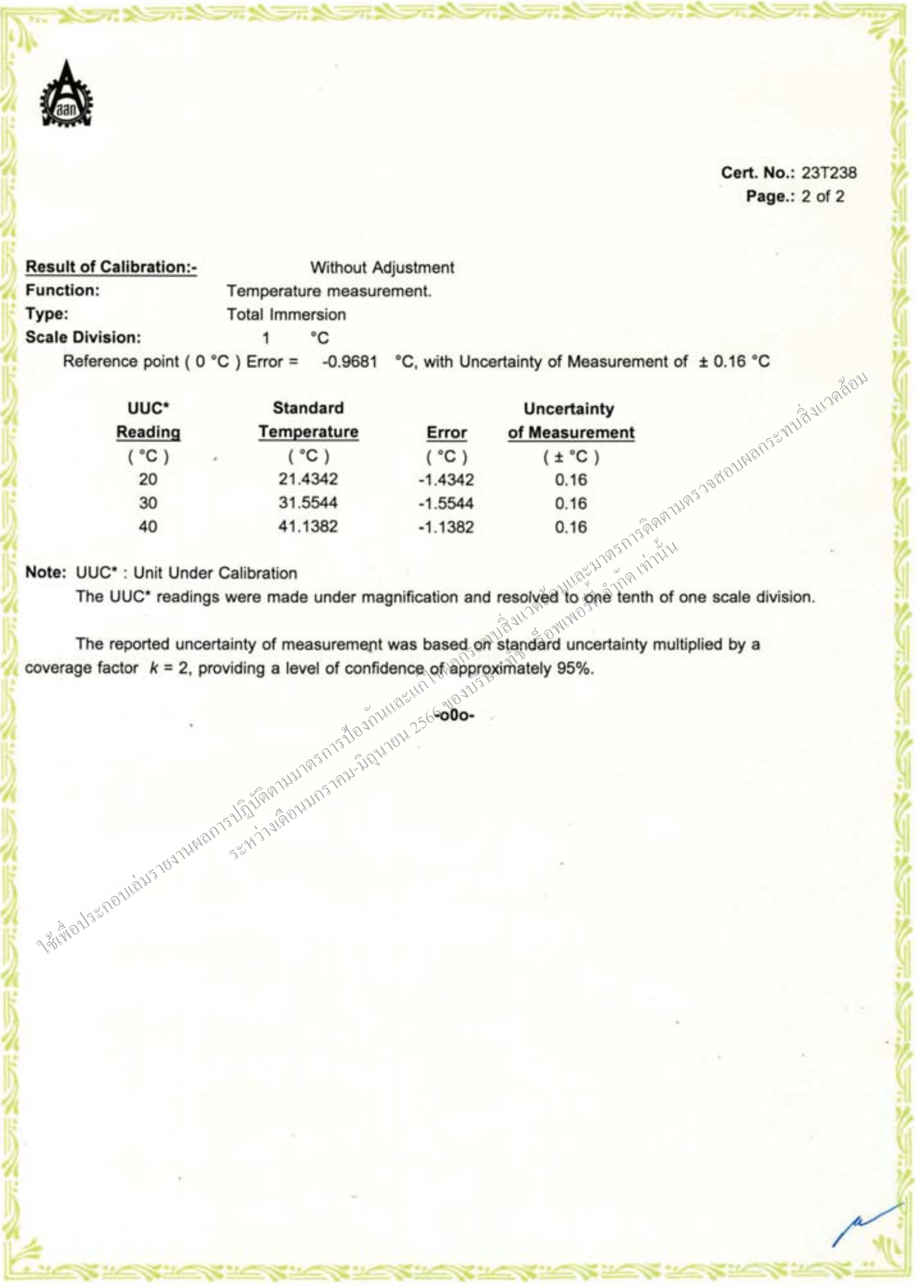
เอกสารแนบ 6

เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์



Cert. No.: 23T238
Page.: 2 of 2

Result of Calibration:- Without Adjustment
Function: Temperature measurement.
Type: Total Immersion
Scale Division: 1 °C

Reference point (0 °C) Error = -0.9681 °C, with Uncertainty of Measurement of ± 0.16 °C

UUC* Reading (°C)	Standard Temperature (°C)	Error (°C)	Uncertainty of Measurement (± °C)
20	21.4342	-1.4342	0.16
30	31.5544	-1.5544	0.16
40	41.1382	-1.1382	0.16

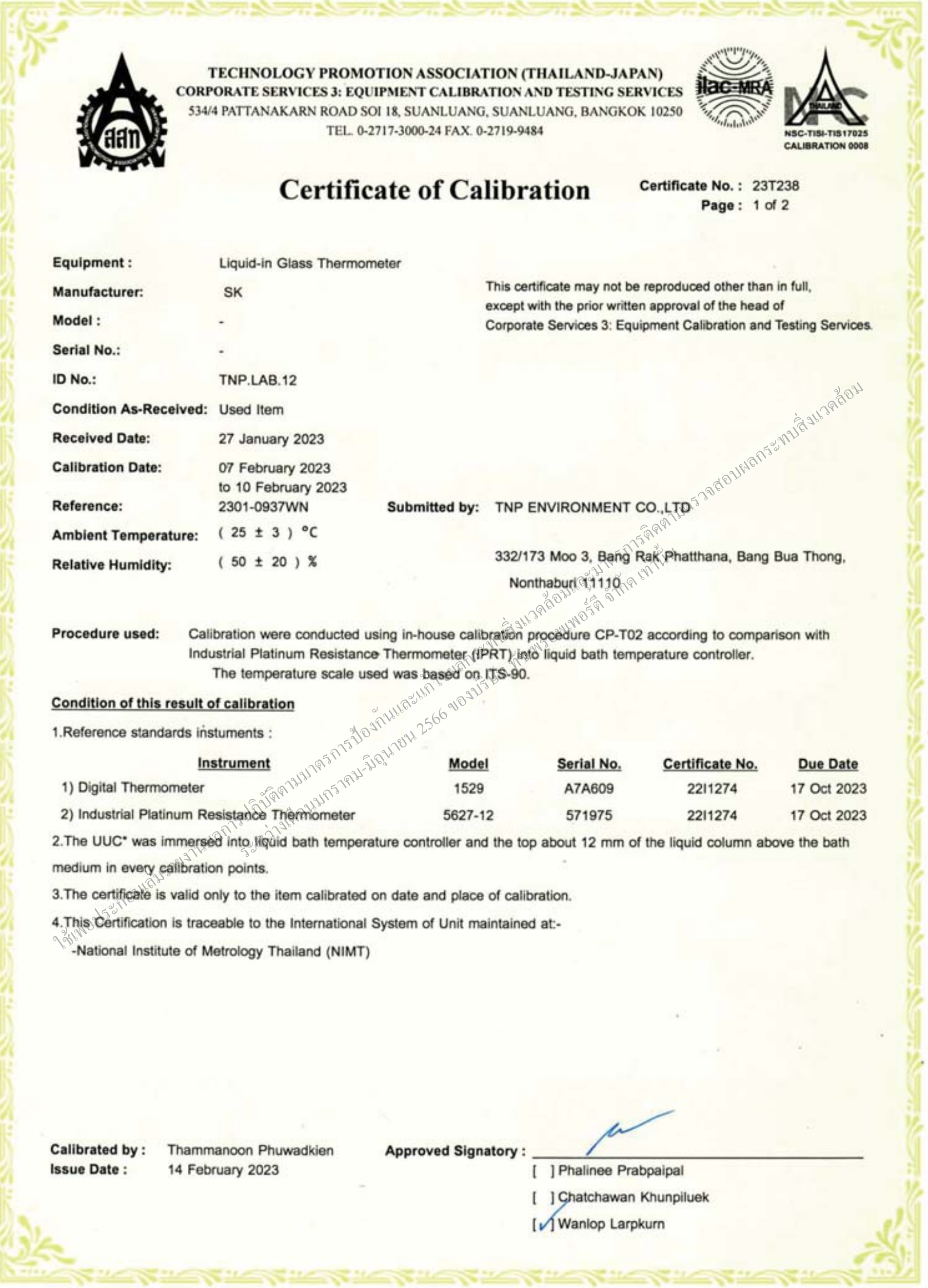
Note: UUC* : Unit Under Calibration
The UUC* readings were made under magnification and resolved to one tenth of one scale division.

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

-o0o-

ใช้เพื่อประกอบเล่มรายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อมและมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม
ระหว่างเดือนมกราคม-มิถุนายน 2566 ของบริษัท [illegible] จำกัด เท่านั้น

a 1147916



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

NSC-TISI-TIS17025
CALIBRATION 0008

Certificate of Calibration

Certificate No. : 23T238
Page : 1 of 2

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.

Equipment : Liquid-in Glass Thermometer
Manufacturer: SK
Model : -
Serial No.: -
ID No.: TNP.LAB.12
Condition As-Received: Used Item
Received Date: 27 January 2023
Calibration Date: 07 February 2023 to 10 February 2023
Reference: 2301-0937WN
Ambient Temperature: (25 ± 3) °C
Relative Humidity: (50 ± 20) %

Submitted by: TNP ENVIRONMENT CO.,LTD
332/173 Moo 3, Bang Rak Phatthana, Bang Bua Thong,
Nonthaburi 11110

Procedure used: Calibration were conducted using in-house calibration procedure CP-T02 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into liquid bath temperature controller.
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1.Reference standards instuments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Digital Thermometer	1529	A7A609	2211274	17 Oct 2023
2) Industrial Platinum Resistance Thermometer	5627-12	571975	2211274	17 Oct 2023

2.The UUC* was immersed into liquid bath temperature controller and the top about 12 mm of the liquid column above the bath medium in every calibration points.

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

4.This Certification is traceable to the International System of Unit maintained at:-
-National Institute of Metrology Thailand (NIMT)

Calibrated by : Thammanoon Phuwadkien
Issue Date : 14 February 2023

Approved Signatory :
[ ] Phalinee Prabpaipal
[ ] Chatchawan Khunpiluek
[✓] Wanlop Larpkurn

ใช้เพื่อประกอบเล่มรายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อมและมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม
ระหว่างเดือนมกราคม-มิถุนายน 2566 ของบริษัท [illegible] จำกัด เท่านั้น

B 0307331

MCL
Microtech Calibration laboratory

ilac-MRA
NAC THAILAND
NSC-TISI-TIS 17025
CALIBRATION 0228

53/154 Moo 2, Semafahkarm Road, Tumbon Khukhot, Amphur Lamlukka, Pathumthani 12130
53/154 หมู่ 2 ถนนเสมาฟ้าคราม ตำบลคูคต อำเภอลำลูกกา จังหวัดปทุมธานี 12130
Tel. 02-9877200 Fax. 02-9877205

Certificate No. : M22 - 1588A
Page : 1 of 4

Certificate of Calibration

Customer	:	TNP ENVIRONMENT CO.,LTD.
Address	:	332/173 Moo 3 Bang Rak Phatthana, Bang Bua Thong, Nonthaburi 11111
Description of Equipment	:	Electronic Balance
Manufacturer	:	Shimadzu
Model	:	AP225WD
Serial Number	:	D316301848
ID. / Control Number	:	TNP.LAB.30
Made In	:	Philippines
Location	:	On - Site
Environmental Conditions	:	Temperature (25 +/- 10) °C
		Humidity (50 +/- 25) % RH
		Atmospheric Pressure (1010 +/- 10) mbar
Calibration Date	:	APR 18, 2022
Issue Date	:	APR 20, 2022

Uncertainty of Measurement

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of k = 2. It has been evaluated according to the "Expression of the Uncertainty of Measurement in Calibration (M3003) " which provides a level of confidence approximately 95%.

Calibrated by : Sarawut Khrueapan **Approved by** [redacted]

HARIKUL SCIENCE

Harikul Science Co.,Ltd.
694 Soi Ratchadanivet 24, Pracharatbamphen,
Samsaennok, Huaikhwang, Bangkok 10310
Tel: 0-2274-2456 Fax: 0-2274-2443
Email: info@harikul.com www.harikul.com

CERT.No.: HS-T031D

Certificate of Calibration

Calibration Date :	22 Apr 22	Model	: YSI 4010-2W
Submitted by :	PINTHONG UTILITIES COMPANY LIMITED	S/N	: 22051520
	789 Moo1 Nong koh-Laen Chabang Rd,	Probe	: YSI 4100
	Nong-kham Sriracha Chonburi Thailand 20230	S/N	: 22C102711
		ID NO.	: -
Avg Room Temp :	20 °C	Air Temp ref	: S/N. E00522
Avg Water Temp :	20 °C	Barometric ref	: S/N. E00522
Air Pressure :	757.00 mmHg	Water Temp ref	: S/N. 11431
Salinity :	0 ppt		
		Technician	: Kittipong M.

Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)		(status)
Measurement 1 (mg/l)	9.05	(PASS)	-	-
Measurement 2 (mg/l)	9.05	(PASS)	-	-
Measurement 3 (mg/l)	9.05	(PASS)	-	-
Measurement 4 (mg/l)	9.03	(PASS)	-	-
Measurement 5 (mg/l)	9.03	(PASS)	-	-
Measurement 6 (mg/l)	9.01	(PASS)	-	-
Measurement 7 (mg/l)	9.01	(PASS)	-	-
Measurement 8 (mg/l)	9.00	(PASS)	-	-
Measurement 9 (mg/l)	9.00	(PASS)	-	-
Measurement 10 (mg/l)	9.01	(PASS)	-	-
Mean Measurement	9.02	mg/l	-	-
Inaccuracy	0.07	mg/l	-	-
Overall Status	(PASS)			

Manufacturer Specification

Accuracy = +/- 0.2 mg/l

1) This certificate is issued based on the result that are found as shown on date and place of test only.
2) The calibration procedure followed in accordance with Harikul Science Co., Ltd.
3) This result shall not be used for advertising purpose.

[redacted]

[redacted]

Certificate of Calibration

Description	: Electronic Balance	**Serial Number**	: D316301848	**Resolution**	:
Manufacturer	: Shimadzu	**ID. /Control Number**	: TNP.LAB.30	**Order No.**	: 1398 - 22
Model	: AP225WD	**Made In**	: Philippines	**Received Date**	: APR 18, 2022
Unit	: g	**Capacity**	: 220 g	**Calibration Date :**	APR 18, 2022

Result of Calibration : Without Adjustment **Resolution :** 0.0001,0.00001 g

Range : 200 g

3. Effect of Center Loadding

Nominal Load g	UUC* Reading					Maximum Difference g
	A g	B g	C g	D g	E g	
50	49.99997	49.99997	49.99995	49.99996	49.99996	0.00002

A Mass of 50 g Was Placed to Various Position on The Pan.
The Weighing Machine Reading Error Obtained Is Given In Table

4. Effect Tare Function

Nominal Tare Weight g	Standard Weight g		UUC* Reading g	UUC* Error g
	Tare		0.00000	0.00000
100	at 20 %	20.0000	20.0001	0.0001
	at 100 %	100.0000	100.0002	0.0002

UUC* = Unit Under Calibration

……… END………

MCL
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บริษัท ไมโครเทค คาลิเบรชั่น แลบบอราทอรี่ จำกัด

Certificate of Calibration

Description	: Electronic Balance	**Serial Number**	: D316301848	**Resolution**	: 0.0001,0.00001 g
Manufacturer	: Shimadzu	**ID. /Control Number**	: TNP.LAB.30	**Order No.**	: 1398 - 22
Model	: AP225WD	**Made In**	: Philippines	**Received Date**	: APR 18, 2022
Unit	: g	**Capacity**	: 220 g	**Calibration Date :**	APR 18, 2022

Result of Calibration : Without Adjustment **Resolution :** 0.0001,0.00001 g

Range : 200 g

2. Departure From Nominal Value

Nominal Value g	UUC* Reading g	UUC* Error g	Uncertainty of Measurement +/- g
0	0.00000	0.00000	0.00013
0.1	0.10003	0.00003	0.00013
0.2	0.20002	0.00002	0.00022
0.5	0.50002	0.00002	0.00043
1	1.00002	0.00002	0.00043
2	2.00005	0.00005	0.00043
5	5.00007	0.00007	0.00068
10	10.00006	0.00006	0.00068
20	20.00003	0.00003	0.00068
50	49.99997	-0.00003	0.00068
100	99.99999	-0.00001	0.00068
200	199.9999	-0.0001	0.00068

UUC* = Unit Under Calibration

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บริษัท ไมโครเทค คาลิเบรชั่น แลบบอราทอรี่ จำกัด

บริษัท ทีเอ็น-ซายน์ จำกัด (สำนักงานใหญ่)
TN-Science Co.,Ltd.(Head Office)
199/588 ต.รังสิต อ.ธัญบุรี จ.ปทุมธานี 12110 เลขประจำตัวผู้เสียภาษี : 0135552001728
โทร : 0-2150-9574-5 โทรสาร : 0-2150-9575 E-mail : info@tn-science.com Webside: www.tn-science.com

Test Certificate **Conducted According to Test 110-95** **of ASHRAE**				หมายเลขตู้ (S/N) :	-	
				อ้างถึงสัญญาซื้อขาย :	-	
				อ้างถึงใบรับประกัน :	-	
				Model :	-	
ชื่อบริษัท	บริษัท ทีเอ็นพี เอ็นไวรอนเม้นท์ จำกัด (สำนักงานใหญ่) 332/173 ต.บางรักพัฒนา อ.บางบัวทอง จ.นนทบุรี 1110 เลขประจำตัวผู้เสียภาษี 0125560008957					
ระยะรับประกัน	-	นับตั้งแต่	-	กำหนดตรวจเช็ค	1 ครั้ง	2 ครั้ง
ตรวจเช็คบริการ ครั้งที่ 1	16/12/2563			ตรวจเช็คบริการ ครั้งที่ 2		

รายการตรวจสอบสภาพตู้ดูดควันไอกรดสารเคมี ดังนี้

ลำดับ	รายการตรวจเช็ค	ผลการตรวจสอบสภาพ			ลำดับ	รายการตรวจเช็ค	ผลการตรวจสอบสภาพ		
		ปกติ	พอใช้	ผิดปกติ			ปกติ	พอใช้	ผิดปกติ
1	ระบบ Air Foil By Pass	✓			19	ความเร็วลมดูดหน้าตู้		✓	
2	หน้าบานประตูตอนบน	✓			20	ระดับเสียงหน้าตู้		✓	
3	หน้าบานประตูตอนล่าง	✓			21	กระแสไฟฟ้าตู้คอนโทรล	✓		
4	กระจกด้านหน้า	✓			22	สวิทช์คอนโทรล	✓		
5	รางกระจก	✓			23	ชุดไฟแสงสว่าง	✓		
6	บานพับ	✓			24	เต้ารับไฟฟ้า	✓		
7	ระบบถ่วงตุ้มน้ำหนัก	✓			25	ระบบท่อลม	✓		
8	ลูกรอก	✓			26	พัดลม	✓		
9	สายสลิง / ตัวล็อค	✓			27	มอเตอร์	✓		
10	สะดืออ่างดักกลิ่น	✓			28	ลูกปืน	—	—	—
11	ก๊อกน้ำ	✓			29	เซนเซอร์วัดความดันอากาศ			
12	วาล์วรีโมทน้ำ	✓			30	ปุ่มฉุกเฉิน	✓		
13	บอลวาล์วน้ำ	—	—	—	31	ความสะอาดในการใช้งาน	—	—	—
14	ข้อต่อท่อและสายน้ำ	—	—	—	32	Water Scrubber		✓	
15	ก๊อกก๊าซ	—	—	—	33	Filter Scrubber	—	—	—
16	วาล์วรีโมทก๊าซ	—	—	—	34	อื่น ๆ			
17	บอลวาล์วก๊าซ	—	—	—					
18	ข้อต่อท่อและสายก๊าซ	—	—	—					

MCL
Microtech Calibration Laboratory Co., Ltd.

Certificate No. : M22 - 1588A
Page : 2 of 4

Certificate of Calibration

Description	: Electronic Balance	**Serial Number**	: D316301848	**Resolution**	: 0.0001,0.00001 g
Manufacturer	: Shimadzu	**ID. /Control Number**	: TNP.LAB.30	**Order No.**	: 1398 - 22
Model	: AP225WD	**Made In**	: Philippines	**Received Date**	: APR 18, 2022
Unit	: g	**Capacity**	: 220 g	**Calibration Date :**	APR 18, 2022

Calibration Method

The Electronic balance was measured using standard weight following to in house calibration method MCL-CP14 and basd on UKAS LAB 14:Edition 5 July 2015

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

Reference Standard

Description	Model	Serial No.	Certificate No.	Due Date
Standard Weight Set	50 mg - 2 kg	N/A	B0-0805057/20	MAY 09, 2021

Traceability of Measurement

The measurements are traceable to international system of units (SI)

The certificate is traceable to through Thai Heart Calibration Co.,Ltd.

Range : 200 g **Resolution :** 0.0001,0.00001 g

1. Repeatability of Balance

Nominal Value g	Standard Deviation of Reading g
0	0.00000
200	0.0000

MCL
Microtech Calibration Laboratory Co.,Ltd
บริษัท ไมโครเทค คาลิเบรชั่น แลบบอราทอรี่ จำกัด

CAL
Calibratech Co.,Ltd.
7/106-7 Moo 2, Sukhaprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120
Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

ilac-MRA
NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : **65-400665-1** **Page : 1 of 2**

Submitted by : TNP Environment Co., Ltd.
332/173 Moo 3 Bang Rak Phatthana, Bang Bua Thong, Nonthaburi 11110

Equipment : Air Chamber (Oven)
Manufacturer : Memmert Model : UF75
Range : N/A °C Resolution : 0.1 °C
Serial No. : B320.0251 ID No. : N/A

Environment : On site calibration was carried out at the Laboratory, TNP Environment Co., Ltd.
Ambient Temperature : (27.0 to 28.0 °C
Relative Humidity : (40 to 45) %
Line Voltage : (228.0 to 230.0) V

Date of Received : 26 December 2022
Date of Calibration : 26 December 2022
Date of Issue : 28 December 2022
Calibrated by : Pernpon Chanpu
Calibration Method : CAL-M4004, TLAS G-20
The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Digital Thermometer with Thermocouple probe

ID No.	Cert. No.	Due Date	Traceability
400029 & 400030	65-400548-1	26 Apr 2023	National Institute of Metrology Thailand (NIMT)

Appr [redacted]

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03

TN-SCIENCE COMPANY LIMITED
TEST AND TRUST
บริษัท ทีเอ็น-ซายน์ จำกัด (สำนักงานใหญ่)
TN-Science Co.,Ltd.(Head Office)
199/588 ต.รังสิต อ.ธัญบุรี จ.ปทุมธานี 12110 เลขประจำตัวผู้เสียภาษี : 0135552001728
โทร : 0-2150-9574-5 โทรสาร : 0-2150-9575 E-mail : info@tn-science.com Webside: www.tn-science.com

การตรวจสอบความเร็วลมด้านหน้าตู้

เปิดประตู้ ที่ความสูง __25__ cm ความกว้างของประตูตู้ __160_ cm

	จุดที่	fpm/mps	จุดที่	fpm/ mps	จุดที่	fpm/ mps		
	1	111	3	115	5	106		
	2	102	4	106	6	124		
	ค่าเฉลี่ย		110					
	*ความเร็วลมเฉลี่ยไม่ต่ำกว่า 100 fpm/0.5 mps ควรเปิดหน้าบานกระจก ในระยะ 30CM. **ผ่านการทดสอบตามมาตรฐาน ASHRE 110-95 PROTOCOL (American standard)							

ความเร็วลมเฉลี่ย = 110 fpm / 0.55 mps
อัตราการไหล = 472 CFM / 13.4 m³/min
ผลการตรวจสอบ = อยู่ในเกณฑ์ที่ยอมรับได้

เครื่องมือที่ใช้สำหรับการวัดค่าลม
ชื่อเครื่อง : Anemometer
รุ่น : DT-620
รหัสเครื่อง : 160415514
อ้างอิงเลขที่ใบรับรอง ISO/IEC 17025 : TTH-0-34257

ปัญหาที่พบ / ข้อเสนอแนะ

หมายเหตุ...

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[redacted]

ENTECH
Where Solutions Begin

Calibration Certificate

NSC-TISI-TIS 17025 CALIBRATION 0157

Certificate No. T/O 660071
Date of issue : 14-Mar-2023

Equipment Description	:	Incubator
Equipment Model	:	SMART i250-DS
Equipment Serial No.	:	0410-0121-0003
I.D. No. or Control No.	:	-
Manufacturer	:	Entech Industrial Solution Co.,Ltd.
Customer Name	:	TNP ENVIRONMENT CO.,LTD.
Customer Address	:	332/173 Moo 3 Tambon Bang Rak Phatthana, Amphoe Bang Bua Thong, Nonthaburi 11110
Total pages of certificate	:	2 pages
Instrument Receiving Date	:	3-Mar-2023
Receiving No.	:	O-230081
Environmental Conditions	:	All of the measurement were carried out in the working area Temperature : (25 ± 15) °C Humidity : (55 ± 30) % RH Voltage : (220 ± 22) VAC
Calibration Place	:	332/173 Moo 3 Tambon Bang Rak Phatthana, Amphoe Bang Bua Thong, Nonthaburi 11110
Calibration Procedure No.	:	This instrument was calibrated by comparison of reference radiation source standard according to calibration work instration no WI-CL-18-C

The calibration certificate expended uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%

The standard uncertainty of measurement has been determined in accordance with M 3003
The expression uncertainty and confidence in measurement.

This certificate is applied only to item under test environmental condition.

This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature and seal are not valid and The results relate only to the items tested/calibrated.

This calibration certificate documents are traceability to national standards, which realize the unit of measurement according to the International system of units (SI).

Date of Calibration : 3-Mar-2023

[redacted]

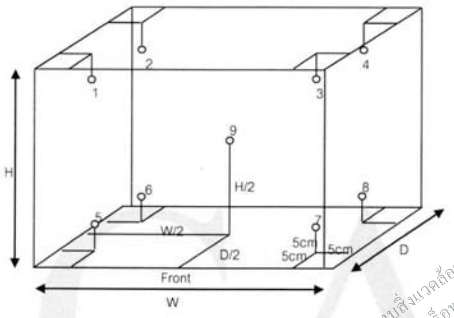
CAL
Calibratech Co.,Ltd.
7/106-7 Moo 2, Sukhaprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120
Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

Certificate of Calibration

Certificate No. : 65-400665-1 **Page : 2 of 2**

Result of Calibration : Without Adjustment
UUC Condition As-Received : Good
Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Inside of Chamber
W = 0.40 m
D = 0.33 m
H = 0.56 m
Capacity = 0.07 m^3

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (±°C)
			1	2	3	4	5	6	7	8	9	
104.0	104.0	104.0	104.2	104.1	104.2	104.0	103.8	103.9	103.9	103.9	104.0	0.69
180.0	180.0	180.0	179.6	179.6	179.7	179.8	180.2	179.5	179.0	179.8	180.5	1.0

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
104.0	104.0	104.0	0.4	0.1	0.7
180.0	180.0	180.0	1.7	0.3	2.0

Remark The uncertainty is not combine uniformity of the air chamber

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

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484

NSC-TISI-TIS17025
CALIBRATION 0008

Cert.No.: 23CH126
Page.: 1 of 2

Certificate of Calibration

Equipment :	pH Meter
Manufacturer :	Adwa
Model :	AD 12
Serial No. :	1328
ID No. :	TNP.LAB.13
Condition As-Received:	Used Item
Received Date :	27 January 2023
Calibration Date :	30 January 2023
Reference :	2301-0937WN-2
Submitted by :	TNP ENVIRONMENT CO.,LTD 332/173 Moo 3, Bang Rak Phatthana, Bang Bua Thong, Nonthaburi 11110
Ambient Temperature :	(25 ± 2.5) °C
Relative Humidity :	(50 ± 15) %
Calibration Procedure :	In - house method : - CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
Calibrated by :	[redacted]
Approved by :	

(✓) Malee Butkruea
( ) Saithip Meangmai
( ) Warakorn Lerngagtrakul

Issue Date : 31 January 2023

The Uncertainties are for a confidence probability of approximately 95%

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A 0050390

Calibration Certificate

NSC-TISI-TIS 17025
CALIBRATION 0157

Certificate No. : T/O 660071

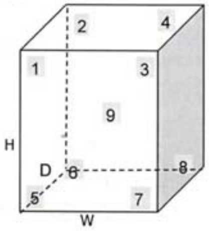
The Reference Standard Instrument :-

Instrument	Model	Serial No.	Cert No.	Due date
1) Data logger with RTD Probe	Agilent 34972A	MY49017365	PSL-T 0524-2/65	4-Apr-2023

Measured room conditions

Temperature :	Minimum:	21.3 °C	Maximum:	22.8 °C
Humidity :	Minimum:	49.3 %RH	Maximum:	54.7 %RH
Voltage :	Minimum:	220.1 VAC	Maximum:	223.4 VAC
Fresh Air Setting:	off			

Sensor Position :



Working Space of chamber :

(Inside Dimensions) W x D x H : 500 mm x 480 mm x 1100 mm

Sensor Installation Details :

- Sensor Number 1 to 8 installed approximately 50 mm From each wall.
- Sensor Number 9 installed approximately geometric of the chamber.

Results : The measurement results of the calibration were reported in the table below.
(*) Without adjustment ( ) After adjustment

UUC* Setting	UUC* Reading	Temperature Reading oF Standard Sensor								
		Sensor Position								
(°C)	(°C)	1	2	3	4	5	6	7	8	9
20.0	20.0	20.34	20.30	20.14	20.18	20.15	20.02	19.93	19.94	20.02

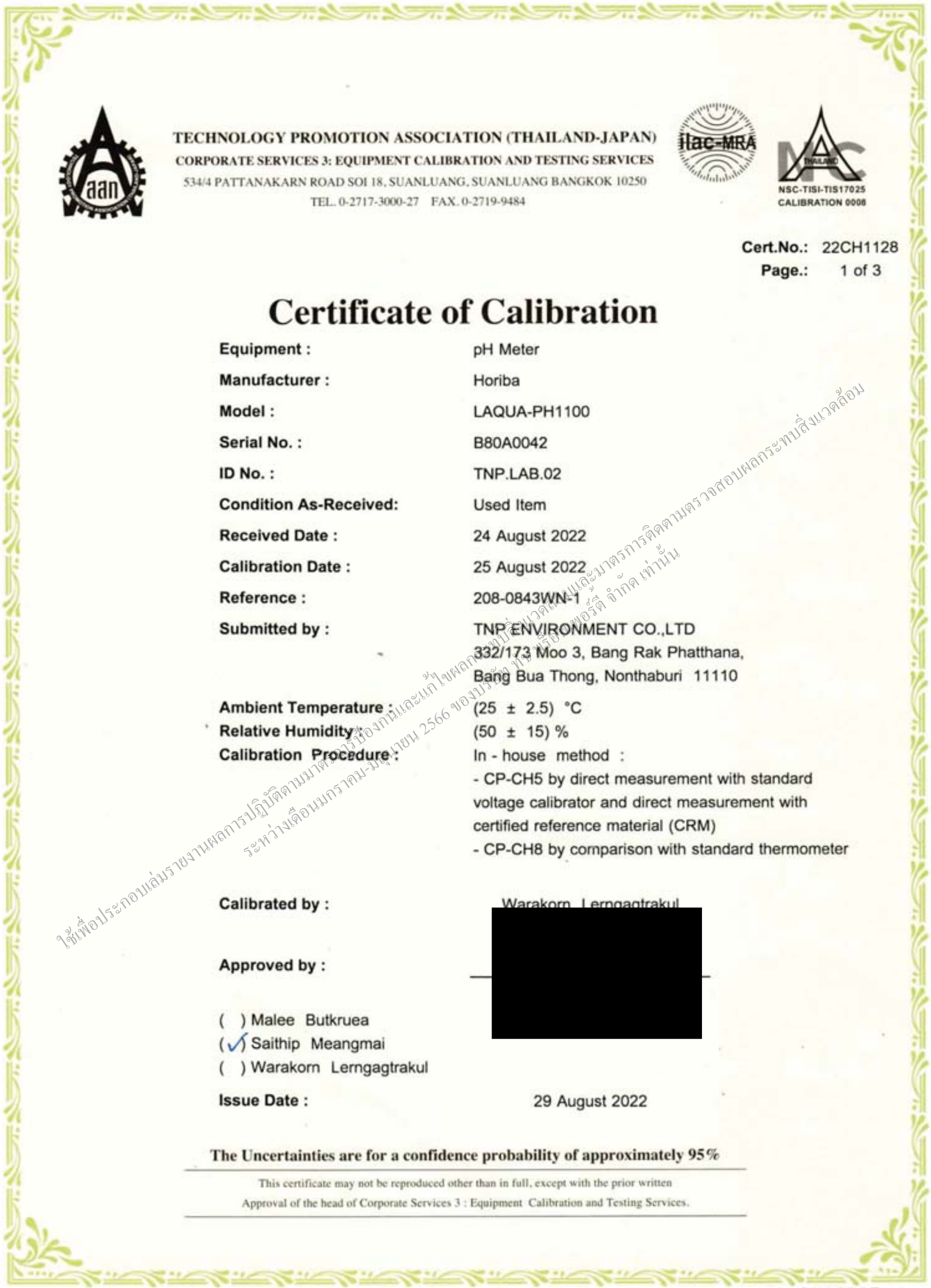
UUC* Setting	UUC* Reading	Temperature Uniformity	Temperature Stability	Overall Variation	Uncertainty of Measurement	Coverage Factor
(°C)	(°C)	(°C)	(± °C)	(°C)	(± °C)	K
20.0	20.0	0.50	0.40	1.00	0.61	2

UUC* = Unit Under Calibration

Remark :-

- Temperature reading of Standard Sensors shown in the table were taken from the average of Standard reading at each position.
- Temperature Uniformity was calculated from the difference between the maximum and minimum of actual temperature reading from all reference sensors at the same time.
- Temperature Stability was calculated from the maximum stability of nine positions, and formula of Stability is [(Maximum Temperature Value - Minimum Temperature Value) /2]
- Overall Variation was calculated from the difference between the maximum and minimum measured temperature throughout observation time.

End of Report



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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NSC-TISI-TIS17025
CALIBRATION 0008

Cert.No.: 22CH1128
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH1100
Serial No. : B80A0042
ID No. : TNP.LAB.02
Condition As-Received: Used Item
Received Date : 24 August 2022
Calibration Date : 25 August 2022
Reference : 208-0843WN-1
Submitted by : TNP ENVIRONMENT CO.,LTD
332/173 Moo 3, Bang Rak Phatthana,
Bang Bua Thong, Nonthaburi 11110

Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lerngagtrakul
[redacted]

Approved by :

( ) Malee Butkruea
(✓) Saithip Meangmai
( ) Warakorn Lerngagtrakul

Issue Date : 29 August 2022

The Uncertainties are for a confidence probability of approximately 95%

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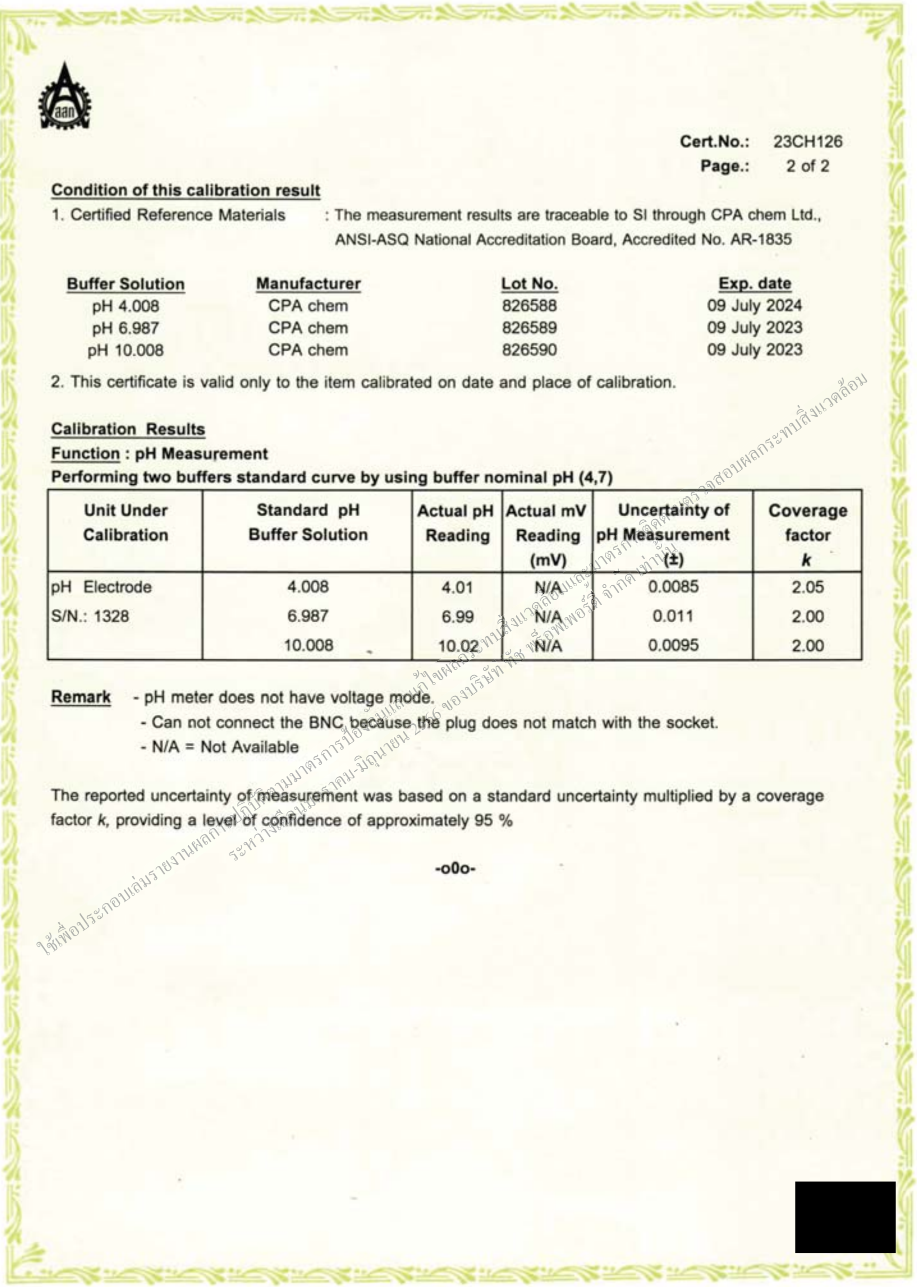
A 0044697



Cert.No.: 23CH126
Page.: 2 of 2

Condition of this calibration result

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	826588	09 July 2024
pH 6.987	CPA chem	826589	09 July 2023
pH 10.008	CPA chem	826590	09 July 2023

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

Calibration Results
Function : pH Measurement
Performing two buffers standard curve by using buffer nominal pH (4,7)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor *k*
pH Electrode	4.008	4.01	N/A	0.0085	2.05
S/N.: 1328	6.987	6.99	N/A	0.011	2.00
	10.008	10.02	N/A	0.0095	2.00

Remark - pH meter does not have voltage mode.
- Can not connect the BNC because the plug does not match with the socket.
- N/A = Not Available

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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[redacted]

a 1144644

ใช้เพื่อประกอบเล่มรายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อมและมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม
ระหว่างเดือนมกราคม-มิถุนายน 2566 ของบริษัท [illegible] จำกัด เท่านั้น

Cert.No.: 22CH1128
Page.: 3 of 3

Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor *k*
pH Electrode S/N.: 9X0B0575	4.008	4.01	153.9	0.0086	2.05
	6.985	6.99	-18.8	0.012	2.05
	10.008	10.01	-190.3	0.011	2.05

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 961X5S
- Serial No. : 9X0B0575

Dimension of probe;

- Length : 87 mm.
- Diameter : 12 mm.
- Immersion Depth : 80 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor *k*
20.0	20.003	20.0	-0.003	0.13	2.00
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.004	30.0	-0.004	0.13	2.00

Remark : UUC* = Unit Under Calibration

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

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[redacted]

a 1123681

Cert.No.: 22CH1128
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	46530031	130RC098	21E3245	07 Oct 2022
2) Ref. Standard Thermometer	4982054	110RC044	2111201	26 Oct 2022

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

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

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	823320	20 June 2024
pH 6.985	CPA chem	794122	14 Feb 2023
pH 10.008	CPA chem	823323	20 June 2023

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor *k*
	pH	mV	mV	pH		
pH Meter S/N.: B80A0042	4.00	177.48	177.4	4.01	0.058	2.00
	7.00	0.00	0.0	7.00	0.058	2.00
	10.00	-177.48	-177.5	10.01	0.058	2.00

[redacted]

a 1123682

Calibration Certificate

Certificate No. : T/O 650134

The Reference Standard Instrument :-

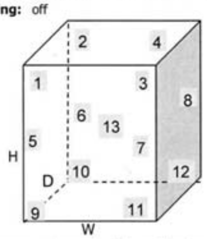
Instrument	**Model**	**Serial No.**	**Cert No.**	
1) Data logger with RTD Probe	Agilent 34972A	MY60008352	PSL-T 0524-3/65	4-Apr-2023

Measured room conditions

Temperature :	Minimum:	30.4 °C	Maximum:	31.6 °C
Humidity :	Minimum:	51.4 %RH	Maximum:	56.7 %RH
Voltage :	Minimum:	220.1 VAC	Maximum:	223.2 VAC

Fresh Air Setting: off

Sensor Position :



Working Space of chamber :

(Inside Dimensions) W x D x H : 1560 mm x 500 mm x 1380 mm

Sensor Installation Details :

- Sensor Number 1 to 12 installed approximately 50 mm From each wall.
- Sensor Number 13 installed approximately geometric of the chamber.

Results : The measurement results of the calibration were reported in the table below.

(*) Without adjustment ( ) After adjustment

UUC* Setting	UUC* Reading	Temperature Reading oF Standard Sensor								
		Sensor Position								
(°C)	(°C)	1	2	3	4	5	6	7	8	9
4.0	4.0	4.52	4.36	4.21	4.00	4.52	4.20	4.77	4.39	4.07
		Sensor Position								
		10	11	12	13					
		4.16	4.17	4.54	4.07					

UUC* Setting	UUC* Reading	Temperature Uniformity	Temperature Stability	Overall Variation	Uncertainty of Measurement	Coverage Factor
(°C)	(°C)	(°C)	(± °C)	(°C)	(± °C)	K
4.0	4.0	1.07	0.93	2.23	1.2	2

UUC* = Unit Under Calibration

Remark :

- Temperature reading of Standard Sensors shown in the table were taken from the average of Standard reading at each position.
- Temperature Uniformity was calculated from the difference between the maximum and minimum of actual temperature reading from all reference sensors at the same time.
- Temperature Stability was calculated from the maximum stability of nine positions, and formula of Stability is [(Maximum Temperature Value - Minimum Temperature Value) /2]
- Overall Variation was calculated from the difference between the maximum and minimum measured temperature throughout observation time.

End of Report

Calibration Certificate

Certificate No.: T/O 650134
Date of issue : 11-Oct-2022

Equipment Description : Refrigerator
Equipment Model : P1010
Equipment Serial No. : P1010-1020-0005
I.D. No. or Control No. : TNP.LAB.01
Manufacturer : Entech Industrial Solution Co.,Ltd.
Customer Name : TNP ENVIRONMENT CO.,LTD.
Customer Address : 332/173 Moo. 3 Tambon Bang Rak Phatthana, Amphoe Bang Bua Thong, Nonthaburi 11110
Total pages of certificate : 2 pages
Instrument Receiving Date : 10-Oct-2022
Receiving No. : O-220115
Environmental Conditions : All of the measurement were carried out in the working area
Temperature : (25 ± 15) °C
Humidity : (55 ± 30) % RH
Voltage : (220 ± 22) VAC
Calibration Place : 332/173 Moo. 3 Tambon Bang Rak Phatthana, Amphoe Bang Bua Thong, Nonthaburi 11110
Calibration Procedure No. : WI-CL-18-C

The calibration certificate expended uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%

The standard uncertainty of measurement has been determined in accordance with M 3003 The expression uncertainty and confidence in measurement.

This certificate is applied only to item under test environmental condition.

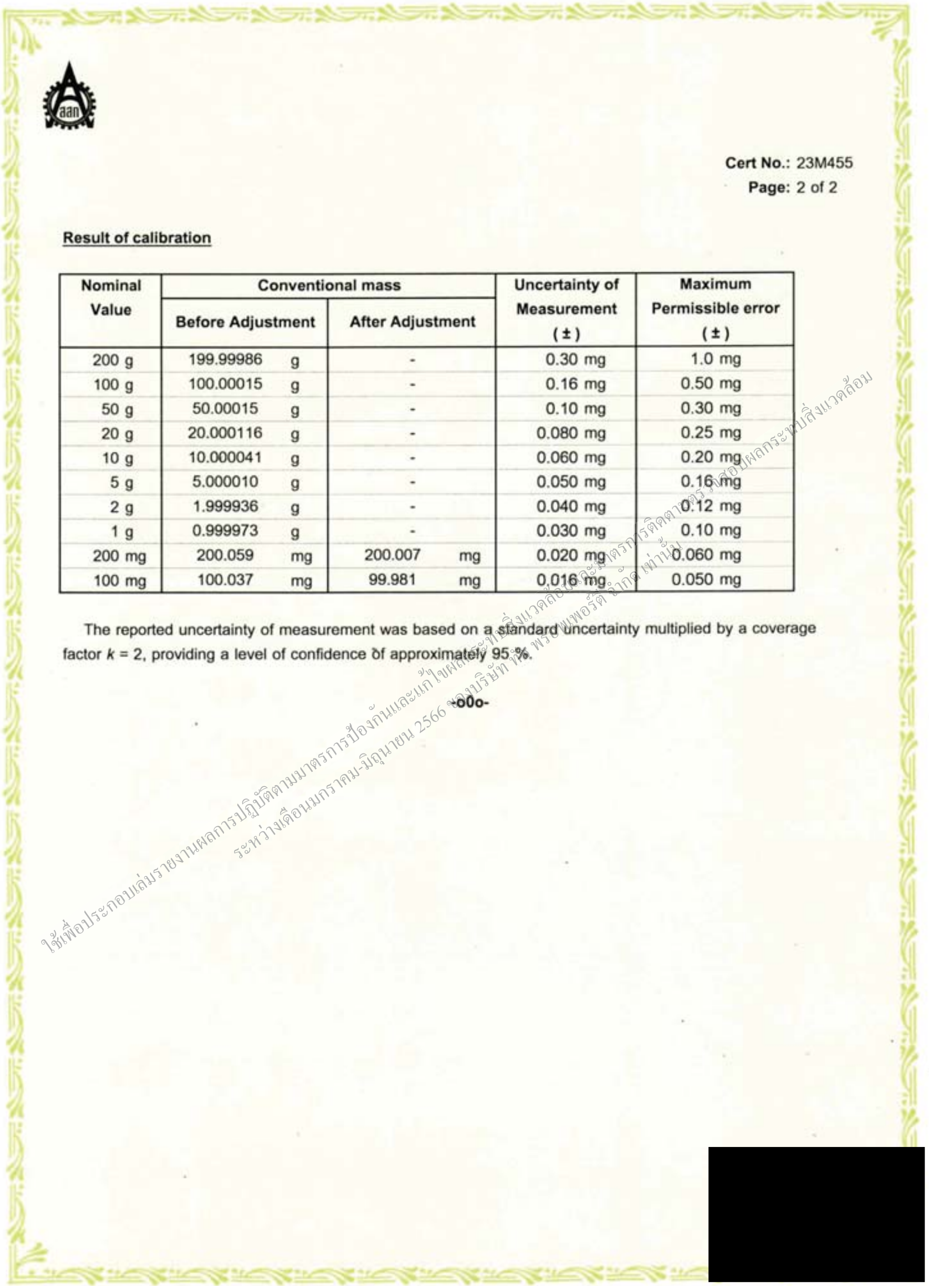
This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates without signature and seal are not valid.

This calibration certificate documents are traceability to national standards, which realize the unit of measurement according to the International system of units (SI).

Date of Calibration : 10-Oct-2022

[redacted]

ใช้เพื่อประกอบผลการตรวจติดตามตรวจสอบผลกระทบสิ่งแวดล้อม



Cert No.: 23M455
Page: 2 of 2

Result of calibration

Nominal Value	Conventional mass		Uncertainty of Measurement (±)	Maximum Permissible error (±)
	Before Adjustment	After Adjustment		
200 g	199.99986 g	-	0.30 mg	1.0 mg
100 g	100.00015 g	-	0.16 mg	0.50 mg
50 g	50.00015 g	-	0.10 mg	0.30 mg
20 g	20.000116 g	-	0.080 mg	0.25 mg
10 g	10.000041 g	-	0.060 mg	0.20 mg
5 g	5.000010 g	-	0.050 mg	0.16 mg
2 g	1.999936 g	-	0.040 mg	0.12 mg
1 g	0.999973 g	-	0.030 mg	0.10 mg
200 mg	200.059 mg	200.007 mg	0.020 mg	0.060 mg
100 mg	100.037 mg	99.981 mg	0.016 mg	0.050 mg

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

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ใช้เพื่อประกอบเล่มรายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อมและมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม
ระหว่างเดือนมกราคม-มิถุนายน 2566 ของบริษัท [illegible] พร็อพเพอร์ตี้ จำกัด เท่านั้น

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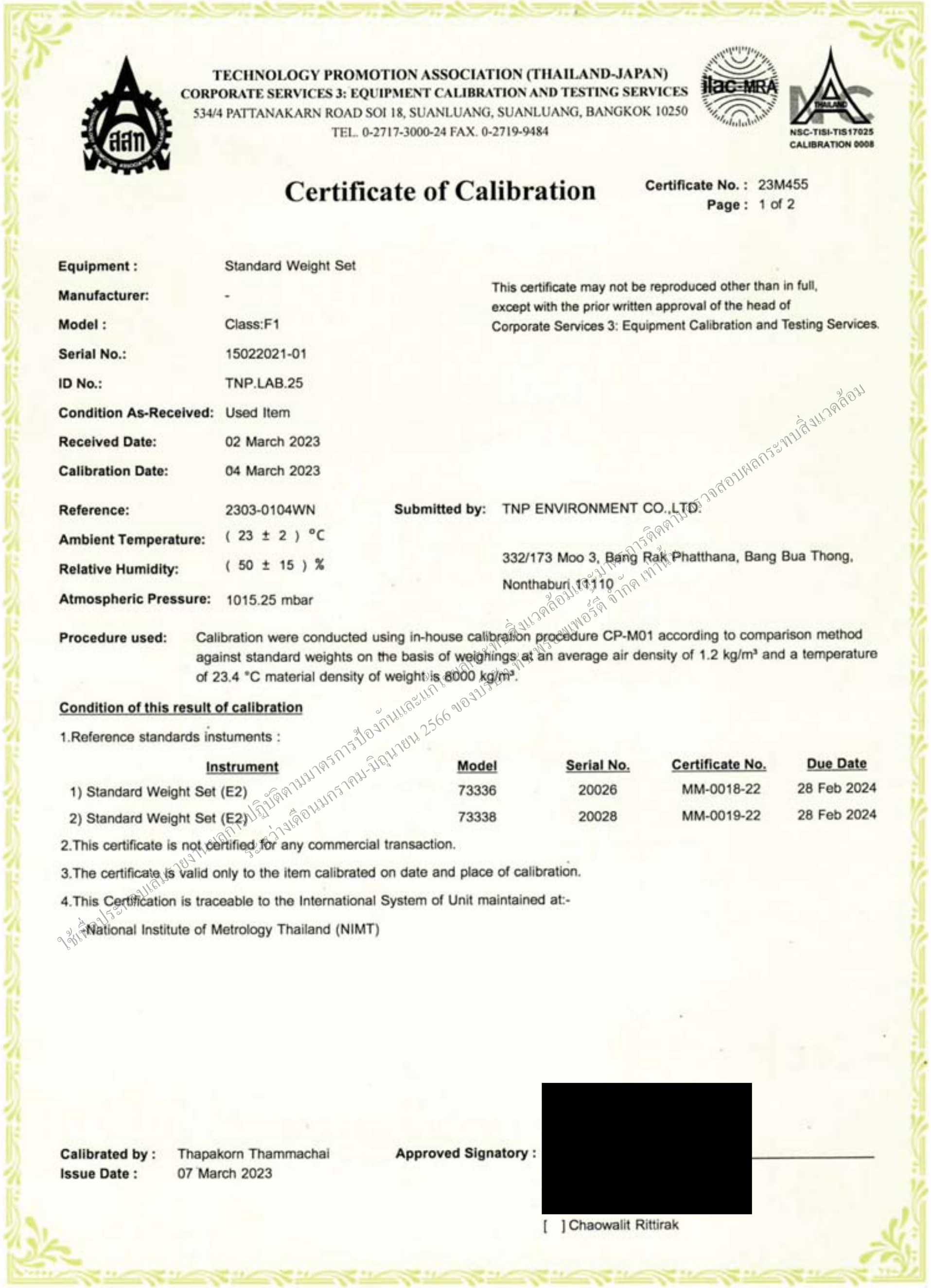
a 1151188



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

NSC-TISI-TIS17025
CALIBRATION 0008

Certificate of Calibration

Certificate No. : 23M455
Page : 1 of 2

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Equipment : Standard Weight Set
Manufacturer: -
Model : Class:F1
Serial No.: 15022021-01
ID No.: TNP.LAB.25
Condition As-Received: Used Item
Received Date: 02 March 2023
Calibration Date: 04 March 2023

Reference: 2303-0104WN
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1015.25 mbar

Submitted by: TNP ENVIRONMENT CO.,LTD.
332/173 Moo 3, Bang Rak Phatthana, Bang Bua Thong,
Nonthaburi 11110

Procedure used: Calibration were conducted using in-house calibration procedure CP-M01 according to comparison method against standard weights on the basis of weighings at an average air density of 1.2 kg/m³ and a temperature of 23.4 °C material density of weight is 8000 kg/m³.

Condition of this result of calibration

1.Reference standards instuments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Weight Set (E2)	73336	20026	MM-0018-22	28 Feb 2024
2) Standard Weight Set (E2)	73338	20028	MM-0019-22	28 Feb 2024

2.This certificate is not certified for any commercial transaction.

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

4.This Certification is traceable to the International System of Unit maintained at:-
-National Institute of Metrology Thailand (NIMT)

Calibrated by : Thapakorn Thammachai
Issue Date : 07 March 2023

Approved Signatory : [redacted]
[ ] Chaowalit Rittirak

ใช้เพื่อประกอบเล่มรายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อมและมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม
ระหว่างเดือนมกราคม-มิถุนายน 2566 ของบริษัท [illegible] พร็อพเพอร์ตี้ จำกัด เท่านั้น

B 0309848

Certificate No. : CT-23-01-23295

Page : 2 of 4

Calibration Result :

Condition of UUC :

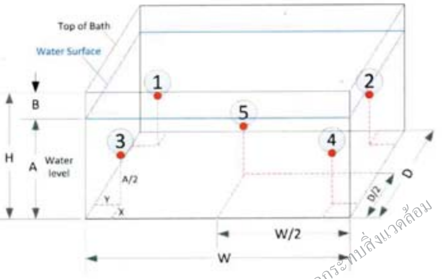
1) Adjust Condition : Without Adjustment
2) Lid Cover : Flat Sheet (Plastic , from
3) Circulation : without circulation
4) X ,Y = 5 cm. , B ~ 3 cm.

(1) The quoted uncertainty include with " Stability".

(2) Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors , for at least half an hour after reaching sted state.

(3) Uniformity = The maximum difference of measured temperatures at two any sensor which are observed at the same time.

(4) Overall variation = The difference of the maximum and the minimum measured temperature througout observation time.



Pic 1 : Position of each sensor No.

Section 1 : Report of Temperature distribution

Unit : (°c)

Calibration Point	UUC Setting (*)	UUC Reading (*)	Measured Temperature @ Sensor No.					Uncertainty (±)	k (**)
			#1	#2	#3	#4	#5		
85	85	85.0	85.30	85.30	84.83	84.76	85.51	0.627	2

(*) = The average of 30 values in each point , (**) = Coverage factor (k) value

Section 2 : Report of Chamber Performance

Unit : (°c)

Calibration Point	UUC Setting (*)	UUC Reading (*)	Temperature Uniformity	Temperature Stability (± °c)	Temperature Overall Variation
85	85	85.0	1.34	0.45	1.64

(*) = The average of 30 values in each point

Approved Signatory : ....[redacted]

Calibration Certificate

Cert. No. : CT-23-01-23295

Page : 1 of 4

Issued date : 24 January 2023

Equipment : Water Bath , Manufacturer : MLAB , Model : WBN30
S/N = 0347 , Customer ID = -

Client : TNP ENVIRONMENT CO.,LTD.
332/173 Moo 3 Bang Rak Phatthana, Bang Bua Thong, Nonthaburi 11110

Received Date : 20 January 2023
Calibrated by : Mr.Apiwat Mungsamak
Calibrated Date : 20 January 2023

Ref. Job No. : SO6601-00020
Cert. prepare by : Ms.Nattanicha Panumram
Approved by : Mr.Montree Ruschasetkul

Calibration Place : ห้องปฏิบัติการ2
Environment Condition : Temperature 28.5 ± 2.7 (°c) , Humidity 57.5 ± 14.5 (%RH)

Calibration Method : In-house method based on ASTM E715-80 (Reapproved 2006) , (MTEC WI No. # WICAL-02-003-R01)

Reference Standard Instrument :

No	Instrument	code	Model	Due date
1	Temperature Data Logger	MTEC-CE-0175	MLAB	10/2023
2	Thermo Hygrometer	MTEC-CE-0183	TP-50	06/2023

Condition of certificate :

(1) This certificate is traceable to International System of units (SI Units). , (2) This certificate was certified only for the instrument we calibrated. , (3) This result of calibration was found accurate as show on date and place of calibration only. , (4) The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = (see result table) , providing a level of confidence of approximately 95%. , (5) This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration Division, Metrology Technical Co.,Ltd.

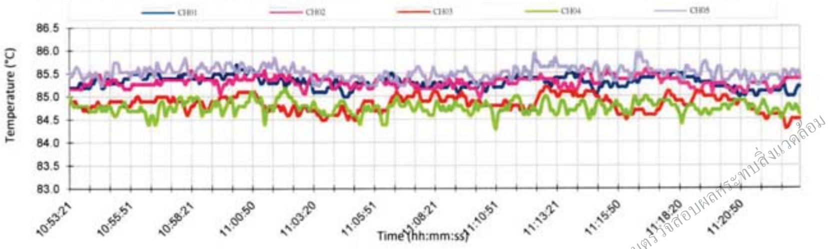
......[redacted]

CER04-01-R02

Certificate No. : CT-23-01-23295

Section 5 : Graph report for Temperature distribution , not include uncertainty of measurement

(5.1) Temperature Distribution at UUC Reading 85.0 °c



Approved Signatory : [redacted]

Certificate No. : CT-23-01-23295

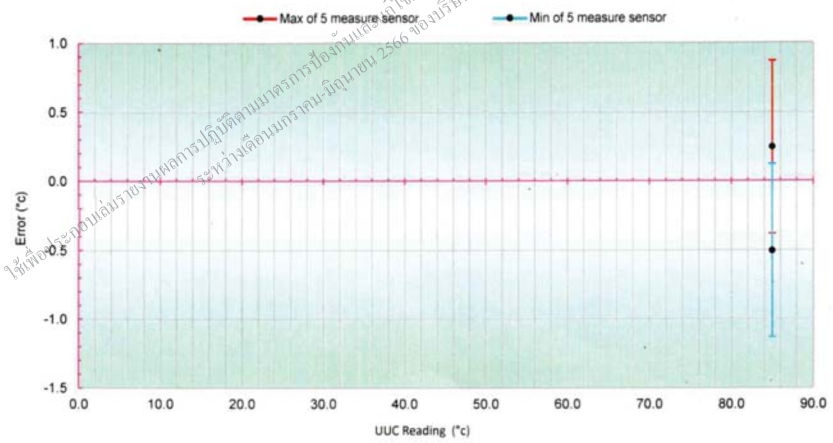
Section 3 : Possible of temperature in chamber. Show minimum and maximum of the average values and include with uncertainty of measurement. , The average values is average of each position standard sensor througout observation time.

Unit : (°c)

Calibration Point	UUC Setting(*)	UUC Reading(*)	Possible of **Minimum** temperature in chamber	Possible **Maximum** temperature in chamber
85	85	85.0	84.13	86.13

(*) = The average of 30 values in each point

Section 4 : Trend of acuuracy



Approved Signatory : [redacted]

FOSS

Customer Service Report

FOSS South East Asia
3388 Sirinrat Building, 25th – 26th Floor, Unit No. 3388/90,
Rama IV Road, Klongton , Klongtoey, Bangkok, Thailand 10110

Report No:	6534
Date:	25/7/2022
Customer:	United Analyst and Engineering
Address:	[illegible]
Instrument:	KT8100
Serial:	91889052

Hours	Travel To Customer		Labour		Travel From Customer	
Start	9.00	0.5	9 - 12 am	6 hr	4.30	1 hr
Finish	9.30		1 - 4 pm		5.30	

Job Type							
Application		**Special**		**Standard**			
Normal		Courtesy Visit		Installation		Training	☒
Distributor		PMA Onboarding		Quote		In House	
Internal		Warranty		Repair		PM	
Digital Service		Sales Support		Remote		Other	

PO/Quote Number:	If applicable		
PMA Type	If applicable	**Contract No.**	If applicable

Details of Work / Test	Condition / Status
	Done
สอนการใช้งาน	
- software	
- program Editor	
- mr Setting	
- Manual Run	
- User maintenance	
- Run Blank	
- Run Recovery	

Instrument Ready for Use	[✓ OK]	Not OK	If not OK - Comment

Part No:	Batch	Description	Qty

I confirm this report is accurate and complete

Signed FOSS		Signed Customer	
Name	Tinudda Somrong	Name	Karnphong Boonpoung.

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

เอกสารไม่ควบคุม

FOSS

Customer Service Report

FOSS South East Asia
3388 Sirinrat Building, 25th – 26th Floor, Unit No. 3388/90,
Rama IV Road, Klongton , Klongtoey, Bangkok, Thailand 10110

Report No:	6623
Date:	July25, 2022
Customer:	United Analyst and Engineering
Address:	กรุงเทพ
Instrument:	KT8100
Serial:	31889052

Hours	Travel To Customer		Labour		Travel From Customer	
Start	8.00	30 mins	9.00-12.00	3+3	16.30	1 hrs.
Finish	8.30		~~13~~ 13.00-16.00	= 6 hrs.	17.30	

Job Type							
Application		**Special**		**Standard**			
Normal		Courtesy Visit		Installation	☒	Training	
Distributor		PMA Onboarding		Quote		In House	
Internal		Warranty		Repair		PM	
Digital Service		Sales Support		Remote		Other	

PO/Quote Number:	If applicable		
PMA Type	If applicable	**Contract No.**	If applicable

Details of Work / Test	Condition / Status
- Unpack ตรวจสอบเครื่อง ไม่พบความเสียหาย	OK
- ตรวจสอบ Accessory kit	OK
- ~~[illegible]~~ ทำการต่อ ท่อน้ำ, ท่อ Alkali, ท่อน้ำเย็น ฯ เข้าเครื่อง	OK
- ตรวจสอบเครื่องตาม IQ, OQ, PQ	OK

Instrument Ready for Use	[✓ OK]	Not OK	If not OK - Comment

Part No:	Batch	Description	Qty

I confirm this report is accurate and complete

Signed FOSS	Pannipa O.	Signed Customer	
Name	Pannipa Onnom	Name	Karnphong Boonpuang

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

เอกสารไม่ควบคุม

Kjeltec™ 8100 Distillation Unit

This IQ applies to Kjeltec™ 8100 Distillation Unit manufactured by FOSS Analytical. The installation is performed by FOSS trained service personnel.

1 Intended Use

Kjeltec 8100 is intended for laboratory use analyzing parameters as specified in FOSS Analytical AB's Application Notes.

2 Purpose

This installation Qualification is designed to assure that:

- The Kjeltec instrument is received complete, with all required parts in good condition.
- The location of the instrument is environmentally and ergonomically suitable
- The instrument is assembled and configured correctly
- Suitable electricity and water are supplied to the instrument, see table 2 for requirements.

3 Identification

Description	Serial Number
Kjeltec 8100 Distillation Unit	918 89052

---

4 Control of Received Equipment

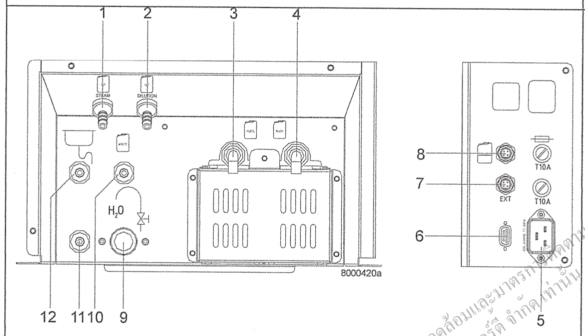
4.1 Verify that the correct instrument type and accessory kit items are received and in proper condition

The packing list (shipped with the instrument) specifies all the items. The installer will verify that all items are received as shipped on the packing list. For each item listed, verify that the acceptance criteria are met. If so, write "Y" in the right column of the table immediately following.

Packing List Item	Acceptance Criteria	Pass/Y/N)
Kjeltec 8100 Distillation Unit	No visible damage, received in undamaged FOSS Analytical's standard shipping container	Y
Accessory kit, according to packing list	Included. No visible damage, received in undamaged FOSS Analytical's standard shipping container	Y
Handling device for digestion tube	Included. No visible damage.	Y
Tanks with level sensors for Waste, Alkali and Water	Included. No visible damage.	Y
Receiver flask	Included. No visible damage.	Y
One digestion tube 250ml One digestion tube 100 ml	Included. No visible damage.	Y
Tube adapter	Included. No visible damage.	Y
User manual	Kjeltec 8100 Distillation Unit	Y
Owners guide	Kjeltec 8100 Distillation Unit	Y
Quick guide	Kjeltec 8100 Distillation Unit	Y
Spare parts manual	Kjeltec 8100 Distillation Unit	Y
Application notes	AN 300 included AN 303 included	Y

5.2 The instrument must be assembled correctly

Verify that all tubes are correct connected. If so, write “Y” in the right column of the table immediately following.

Instrument Tubing Connections	Acceptance Criteria	Pass (Y/N)
 1 2 3 4 STEAM DILUTION H2O 8000420a 8 7 6 T10A EXT T10A 5 12 11 10 9 1. Deionised water in (steam generator) 2. Deionised water in (dilution water) 3. *) Receiver solution in 4. Alkali in 5. Power 6. Not used 7. External titration module 8. Level sensors 9. Cooling water in (tap water) 10. Waste water out (tube drain vessel) 11. Drain 12. Cooling water out (tap water) *) Only on Kjeltec 8200	Visual verification by installer	Y

---

5 Installation

5.1 The equipment must be installed in a suitable location with power, water and draining available

Verify that the instrument installation site meets the acceptance criteria given in the table below. If so, write “Y” in the right column of the table immediately following.

Location Requirements	Acceptance Criteria	Pass (Y/N)
Adequate space for instrument	Dimensions 48x58x69 cm	Y
AC supply available for instrument	200-240 V 50/60Hz	Y
Current	10 A	Y
Cold water supply available	2 L/min at 30°C	Y
Drain	For cooling water and waste (depending on local waste disposal legislation)	Y
Ambient temperature	Max. 40°C	Y
Ambient humidity	Max. 80% relative	Y
Internal fuses	T10A AH	Y

5.3 The instrument should be assembled and powered up

Connect the distilling unit to the power supply. Perform the start up procedure and check that the expected response is obtained. If so, write "Y" in the right column of the table immediately following.

Action	Expected Response	Pass (Y/N)
Switch on the power	The instruments start up and the self test will run. The sample counter shows the number of analysed samples since first power and the Software Version shows the version of the instruments software.	Y
	After start-up, Program 1 is loaded and the Analyse menu is displayed.	Y
Turn on the cold water tap	No visible reaction	Y
Press the **"Manual"** view	The Manual menu is opened	Y
Open the door with the handle, place the test tube and receiver flask in position. Close the door.		Y
Select **Dilution** and press **Start**	Water is added to the tube	Y
Select **Alkali** and press **Start**	Alkali is added to the tube	Y
Select **Steam** and press start	After heating up, steam is entering the tube	Y
Select **Drain** and press **Start**	The tube is drained	Y

6 Summary of Deviations/Comments

Deviations from above requirements are specified below and any corrective actions are noted.

Deviation	Action	Comment

7 IQ Documentation

Upon successful completion and recording of all instructions above, sign and date this sheet below. If required by customer, leave one signed copy with instrument.

If customer's internal procedures require further reporting or witnessing of results, execute those procedures as required.

Installed By: Pannipa Onnom

Company: Foss SEA

Customer Name: ~~United Analyst and Engineering~~

Company: United Analyst and Engineering

Date completed: July 25, 2022

Kjeltec™ 8100 Distillation Unit

This OQ applies to Kjeltec 8100 Distillation Unit manufactured by FOSS Analytical. The operation qualification is performed by FOSS trained service personnel.

1 Intended Use

Kjeltec 8100 is intended for laboratory use analyzing parameters as specified in FOSS Analytical Application Notes.

2 Purpose

This procedure is designed to test the function of the instrument according to factory test specifications:

- Alkali volume
- Distillation Accuracy
- Distillation Repeatability

3 Identification

Description	Serial Number
Kjeltec 8100 Distillation Unit, 200-240 V 50/60 Hz	91889052

4 Performance

4.1 Verify the dispensed volumes of reagents

Note! To verify the dispensed volumes of reagents a triple test should be done to be statistic correct. Then calculate a mean value.

1. Choose "Manual" in the menu. (When starting up the instrument Program 1 is loaded)
2. Open the safety door by pressing **Open** and place a tube in the instrument. Close the safety door.

Water

1. Press **Dilution** and then press **Start**. 80 ml of water will be filled into the tube.
2. Measure the collected water in a graduated measuring glass and note the result in table 1 below.
3. Check acceptance criteria in the table and make the judgment if passed or not.

Note! If the water volume needs to be calibrated, go to 4.8.5 Dilution Pump Calibration in the User Manual.

Alkali

1. Press **Alkali** and then press **Start**. 50 ml of alkali will be filled into the tube.
2. Measure the collected alkali in a graduated measuring glass and note the result in table 1 below.
3. Check acceptance criteria in the table and make the judgment if passed or not.

Table 1 Volume control

Test	Result	Expected result	Passed (Y/N)
Water volume	83 ml 83 ml 82 ml Mean 82.67 ml	76- 84 ml	Y
Alkali volume	52 ml 52 ml 53 ml Mean 52.33 ml	47- 54 ml	Y

4.2 Verify the distillation procedure, accuracy and precision

The distillation principle is to convert ammonium (NH_4^+) into ammonia (NH_3) by using an alkali (NaOH) and thereafter steam distil it into a receiver flask containing boric acid and titrate with standard acid solution using colorimetric end-point detection. Ammonium sulphate, a substance with known ammonia content, can be used to check the accuracy of the distillation. The recovery is calculated from obtained result.

The way to perform this test will be described in the following.

Chemical Check

Use ammonium sulphate $(NH_4)_2SO_4$, purity > 99.5 % *)

Mol. weight = 132.14 g/mol, Nitrogen content in ammonium sulphate (99.5 %) = 21.09% *)

Analysis conditions according to AN 300

Water	80 ml
Alkali	50 ml NaOH (40%w/w)
Receiver solution	30 ml boric acid (4%)
Distillation time	5 minutes
SAfE	5 seconds
Titrant	0.2N HCl

For reagent preparation see Appendix A

1. Start the instrument and run two blanks without chemicals according to above analysis conditions, distil into a receiver flask containing boric acid. Titrate with a standard acid solution using colorimetric end-point detection. If the blanks are less than 0,2 ml continue with the recovery tests:
2. Weigh 0.15 g ammonium sulphate into a tube. Prepare 6 samples (tubes).
3. Run the six samples according to above analysis conditions. Titrate with a standard acid solution using colorimetric end-point detection.
4. Calculate the recovery according to below equations. Expected results of recovery should be 100%±1%.

Recovery test	Result	Expected result	Passed (Y/N)
Blank value (water blank)	1. 0.08 ml 2. 0.14 ml	0.05-0.20 ml	Y
Recovery	1. 100.30 % 2. 100.30 % 3. 100.63 % 4. 99.01 % 5. 99.97 % 6. 100.01 %		
Accuracy	Mean Value: 100.03	99-101%	Y
Precision	SD: 0.557	SD <1%	Y

---

*) **Note!** Please also note that the below calculations must be adjusted if other purity levels of ammonium salts are used. A certificate for the chemical supplier should be available

Purity	Nitrogen content
99,5%	21.09% ✓
99,6%	21.12%
99,7%	21.14%
99,8%	21.16%
99,9%	21.18%

$$\% \, Nitrogen = \frac{(ml_{sample} - ml_{blank}) \times \overset{0.1095}{N} \times 14{,}007 \times 100}{mg_{sample}}$$

21.72

N = Normality of titrant to 4 places of decimal.

$$\% \, Recovery = \frac{\% Nitrogen}{21.09} \times 100$$

mg sample

① ~~0.1592~~ 23.56

②

③

④

⑤

⑥

5 Summary of Deviations/Comments

Deviations from above requirements are specified below and any corrective actions are noted.

Deviation	Action	Comment

6 OQ Documentation

Upon successful completion of tests above, sign and date this sheet below. If required by customer, leave one signed copy with instrument.

If customer's internal procedures require further reporting or witnessing of results, execute those procedures as required.

Performed By: ______________________

Company: ______________________

Customer Name: ______________________

Company: ______________________

Date completed: ______________________

---

7 Appendix A

7.1 Preparation of Reagents

7.1.1 Alkali

To convert ammonium into ammonia an excess of sodium hydroxide is necessary.

Use 400 g NaOH per litre of solution. Commercially available in concentrations up to 50 %. Do not use concentrations above 40 % as this will lead to crystal formation impairing the function of the pumps. If you can only buy concentrations > 40 %, dilute it before use.

7.1.2 Titrant acid, determination of concentration

To be able to achieve accurate nitrogen / protein results, one must be quite sure that the HCl (hydrochloric acid) concentration is what it is supposed to be. A titration against a predetermined solution of sodium carbonate as described below is thus necessary. Incorrect HCl concentration can otherwise cause substantial errors.

- **Standard substance**
  Weigh approx. 10 g of anhydrous sodium carbonate (Na_2CO_3). Use a mortar to make a fine powder. Dry it for 1 h at 265 °C or 2 h at 200 °C. After cooling in a desiccator, transfer the sodium carbonate to a beaker with a tight lid. Store it in a desiccator.
- **Indicator solutions**
  Dissolve 0.1 g methyl red in 100 ml methanol. Dissolve 0.1g bromocresol green in 100 ml methanol.
- **Procedure**
  Weigh approx. 0.4 g of the standard substance, using an analytical balance, note the weight

  (W_1). Transfer the sodium carbonate to a receiver flask and add 40 ml of H_2O (distilled or deionized). Add 8 drops from each of the indicator solutions. Titrate to pink. Note the amount in ml used (A_1). Boil this solution for a few minutes. The solution will turn green. Cool rapidly to room temperature under running water. Continue the titration until the next pink colour change occurs. Note also this volume

  (A_2). Boil the solution for a few minutes. Cool rapidly to room temperature under running water. Continue the titration until the next pink colour occurs. Note also this volume (A_3)

  Note! Temperature changes will influence the volume and the concentration of the titrant solution. The working temperature of the titrant should approximate that of its temperature during standardization. If temperature corrections are necessary, sufficient accuracy may be obtained by use of a correction table. (AOAC 942.25)

FOSS **Performance Qualification**

Kjeltec™ 8100 Distillation Unit
Tecator™ 2508/2520 Digestor

1 Scope

This PQ applies to the Digestion system 2508/2520 (including exhaust and scrubber unit) and Kjeltec 8100 Distillation Unit manufactured by FOSS Analytical. The user of the instrument performs the PQ.

2 Intended Use

The Digestion system (including exhaust and scrubber) and Kjeltec 8100 Distillation Unit are intended for laboratory use analyzing parameters as specified in FOSS Application Notes.

3 Purpose

The guidelines are intended to assist the user in successfully developing Performance Qualifications for the specific application(s) to which the instrument is applied.

The Performance Qualification (PQ) includes the process of demonstrating that the Digestion system 2508/2520 (including exhaust and scrubber unit) and the Kjeltec 8100 Distillation unit consistently perform according to a specification appropriate for its routine use. Main activities in the PQ phase are:

- Preventive maintenance
- On-going verification tests

This document suggests routines to fulfill the requirements for an acceptable PQ but the final procedure should be adapted to local routines for similar equipment.

4 Definition of Test Procedures

4.1 Preventive Maintenance

Maintenance of the Kjeltec 8100 should be performed according to the instructions in manual, see User Manual Kjeltec 8100/8200 Distillation Unit, chapter 5. Maintenance. A yearly service is recommended (service agreement).

Maintenance of the Digestion block (including exhaust and scrubber) should be performed according to instruction in the user manual, see User Manual Tecator Digestor, chapter 5. Maintenance.

ใช้เพื่อประกอบเล่มรายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อมและมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม
ระหว่างเดือนมกราคม-มิถุนายน 2566 ของบริษัท [illegible] จำกัด เท่านั้น

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Web www.foss.dk

7.2 Calculation

$$Molarity\ (M) = \frac{18{,}870 \times W_1}{(A_1 + A_2 + A_3)}$$

Note! Concentration must be accurate to four digits, i.e. 0.2000 M.

Note! The colour change of this official procedure (AOAC 936.15) may be difficult to see, therefore a pH meter or a mixed indicator (e.g. 0.1 g Methyl red and 0.1 g Bromocresol green in 100 ml methanol) will make it much easier to perform.

7.3 Receiver Solution

Boric acid 4 % with bromocresol green / methyl red indicator solution

In order to obtain accurate results the receiver solution is adjusted so that a small (0.05-0.20 ml) positive blank is obtained when running a blank sample. The 4 % boric acid receiver solution is prepared by dissolving 400 g of boric acid in about 5-6 l very hot deionized water. Mix and add more hot deionized water to a volume of about 9 l. Cool the solution to room temperature and add 100 ml of bromocresol green solution (100 mg in 100 ml methanol) and 70 ml of methyl red solution (100 mg in 100 ml of methanol). Dilute to 10 l with deionized water and mix carefully.

Note! The addition of alkali is to achieve a positive blank value. This should, however, be kept between 0.05 - 0.20 ml titrant, to obtain good repeatability when testing blanks.

Adjustment of the boric acid is made by the following procedure:

1. Transfer 25 ml boric acid solution to a receiver flask and add 100 ml of distilled water. If the solution in the flask is still red, titrate with 0.1 M sodium hydroxide solution until a neutral grey colour is obtained. Calculate the amount of sodium hydroxide solution necessary to adjust the boric acid solution in the 10 l flask with the formula: ml 1.0 M alkali = ml titrant x 40
2. Add the calculated amount of 1.0 M alkali solution to the boric acid solution. Mix.
3. To check proceed as follows using 25 ml of the boric acid solution. Run a blank. If the value of this blank is high (0.5 ml of 0.2 M HCl) the boric acid is incorrectly adjusted. This might create irregular blanks. For correction add HCl directly into the boric acid tank, mix it carefully and repeat until a reading of 0.05 - 0.20 ml HCl is obtained. If a positive blank is not achieved, add further small quantities of 1 M NaOH and repeat the check until a satisfactory value is achieved.

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ระหว่างเดือนมกราคม-มิถุนายน 2566 ของบริษัท [illegible] จำกัด เท่านั้น

4.2 Ongoing Qualification Tests

Block Temperature

The temperature for the digestion is limited by the boiling point for the sulphuric acid, this can be increased by adding a salt (K_2SO_4) to the digestion mixture. It's important that the optimal ratio between acid and salt is kept; please follow recommendation in AN 300 or suggested procedures for a specific kind of sample material.

The block temperate itself can be controlled external by inserting a temperature probe in the intended hole in the aluminium block (front row of holes).

Use the reagents and method procedure specified in AN 300. Use only reagents of recognized analytical grade, unless otherwise specified and distilled or demineralised water o water of equivalent purity.

Suggested standard material for internal quality control:

Ammonium sulphate [$(NH_4)_2SO_4$], min. 99.5 % (mass fraction), with certified purity.

Note: The above chemical is usually readily available with a certificate specifying the purity.

Alternatively ammonium iron(II) sulphate, $(NH_4)_2$ Fe $(SO_4)_2$ x 6 H_2O, with certified purity may be used.

Tryptophan ($C_{11}H_{12}N_2O_2$), minimum assay 99 % (mass fraction). Nitrogen content 137.2 g/kg. Do not dry in an oven before use.

Acetanilide (C_8H_9NO), minimum assay 99 % (mass fraction). Nitrogen content 103.6 g/kg. Do not dry in an oven before use.

Sucrose, ($C_{12}H_{22}O_{11}$), with a nitrogen content of not more than 0.002 % (mass fraction). Do not dry in an oven before use.

Blank Tests

Carry out a blank test following the currently used procedure for digestion, distillation and titration taking 2 ml of water and about 0.7 g of sucrose instead of the test portion. Keep a record of blank values. If blank values change, identify the cause.

Note: The amount of titrant used in the blank test should always be greater than 0.0 ml. Blanks within the same laboratory should be consistent across time.

4.3 Recovery Tests

Regularly run recovery studies to check the accuracy of procedure and equipment:

- *Nitrogen loss.* - Use 0.12 g ammonium sulphate and 0.67 g sucrose per flask weighted to the nearest 0.1 mg. Add all other reagents as stated in the method currently used (Kjeltabs, H_2SO_4, etc). Digest and distil under same conditions as for sample. Recoveries shall be >99 %.
- *Digestion efficiency* - Use a test portion of minimum 0.15 g of tryptophan or acetanilide and 0.67 g sucrose per flask weighed to the nearest 0.1 mg. Determine the nitrogen content according to the current procedure in use. The recoveries of tryptophan shall be >98.5 %; the recoveries of acetanilide shall be >99.5 %.
- *Distillation and titration efficiency* – Distil 0.10 – 0.15 g ±0.0001 g ammonium sulphate, omitting the digestion step. The recoveries should be >99.5 %.

Note: Results less than 98.5 % or more than 101.0 % in either of the recovery tests indicate failures in the procedure and/or inaccurate concentration of the standard volumetric hydrochloric acid solution (should be adjusted to four decimals accuracy according to procedure in AN 300)

External Quality Control Program

It is recommended to participate in an external quality control program, such a proficiency program or ring test, with equivalent sample material as analysed within the laboratory.

Calculation and Expression of Results

$$w_n = \frac{14.007(V_s - V_b)N \times 100\%}{m}$$

Where:

w_n is the nitrogen content of the sample, expressed as a percentage by mass.

V_s is the numerical value of the volume of the hydrochloric acid standard volumetric solution) used in the sample test, in milliliters, expressed to the nearest 0.05 ml.

V_b is the numerical value of the volume of the hydrochloric acid standard volumetric solution used in the blank test, in milliliters, expressed to the nearest 0.05 ml.

N is the numerical value of the exact normality of the hydrochloric acid standard volumetric solution, expressed to four decimal places.

m is the numerical value of the mass of the test portion , in milligrams, expressed to the nearest 1 mg for sample weights >1 g or to the nearest 0.1 mg for sample weights <1 g.

5 Maintenance

5.1 Maintenance Kjeltec™ 8100

See instructions in User Manual - Kjeltec 8100/8200, chapter 5 Maintenance.

5.2 Maintenance Tecator™ Digestor

See instructions in User Manual - Tecator Digestor, chapter 5 Maintenance.

6 The Maintenance Record Charts

This record charts are provided to assist you in keeping your system in good working order. Please make copies and use them regularly as they can often help us to help you in the unlikely event a system malfunction.

6.1 FossCare™ Service Log

Date	Work Performed and Parts Used	FOSS Representative	Customer Representative	FossCare™ Service Report No. 1)

1) Applicable for FOSS sales and service companies.

Date	Work Performed and Parts Used	FOSS Representative	Customer Representative	FossCare™ Service Report No. 1)

1) Applicable for FOSS sales and service companies.

6.2 FossCare™ Customer Log

6.2.1 Daily Maintenance

Date	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Steam Cleaning														
Cleaning of Drip Tray, Tube Support and Safety Door														
Cleaning of Tube Adapter														
Cleaning from Spillage														
Check of Sample Racks														
Signature														
Number of analyses														

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6.2.2 Weekly Maintenance

Date	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Check of Safety Functions														
Check of Reagent Tanks														
Check of Digestion Tubes														
Signature														
Number of analyses														

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6.2.4 Additional Maintenance

Date	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Cleaning of Steam Generator														
Signature														
Number of analyses														

6.2.3 Every 1-3 Months Maintenance

Date	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Cleaning of Alkali Pump														
Cleaning of Splash Head														
Cleaning of Receiver Solution Dispensing System														
Check of Tube Adapter														
Signature														
Number of analyses														

6.2.6 Exchange of Parts and Reagents Maintenance

Date	Exchange of Parts and Reagents	Signature

6.2.5 Yearly Maintenance

Date	/	/	/	/	/	/	/	/	/	/	/	/	/	/
FOSS Service Visit														
Signature														
Number of analyses														

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:

1. This instrument was calibrated by insert standard thermocuples 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	MY44045576/MY41194453	TC21/0041	24-Apr-2022	N.M. Technical Center Laboratory
	Type R	TC#101-103 / CH#101-103			

3. This certificate is traceable to international system of units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of Calibrated item : Good
   UUC* Description
   Time of Record - Hour 30 Minute At 380 °C
7. Result of Calibration : ☒ Without adjustment ☐ After adjustment

[redacted]

เอกสารไ

Verification Certificate

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

Approved by [redacted]
Manage ry
Responsib eam

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.

เอกสารไม่ควบคุม

National Food Institute, Ministry of Industry, Thailand
2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand
Tel : +66 (0) 2422 8688 Fax : +66 (0) 2422 8545 Website : www.nfi.or.th E-mail : cal@nfi.or.th

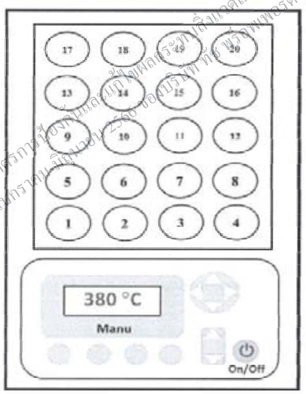
Verification Report

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

Calibration point:	380 °C
Calibration result:	Continued

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

TOP VIEW



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 ----------

เอกสา[redacted]ุม

National Food Institute, Ministry of Industry, Thailand
2008 Soi 36, Arun Amarin Road, Bang Yi Khan Subdistrict, Bang Phlat District, Bangkok 10700, Thailand
Tel : +66 (0) 2422 8688 Fax : +66 (0) 2422 8545 Website : www.nfi.or.th E-mail : cal@nfi.or.th

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

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.

[redacted]
เอกสารไม่ควบคุม

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ระหว่างเดือนมกราคม-มิถุนายน 2566 ของบริษัท ทีซี พร็อพเพอร์ตี้ จำกัด เท่านั้น

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

NSC-TISI-TIS17025
CALIBRATION 0008

Cert. No.: 22TM565
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 :	7 April 2022
Calibration Date :	7 April 2022
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %
Calibrated by :	Prawit Sodavitchit
Approved by :	[redacted]

( ) Pornthippa Tameyakul
(✓) Malee Butkruea
( ) Suwit Imjai

Issue Date : 18 April 2022

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม

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ระหว่างเดือนมกราคม-มิถุนายน 2566 ของบริษัท ทีพี พร็อพเพอร์ตี้ จำกัด เท่านั้น

Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2204-0016OC-4

Cert. No.: 22TM565
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

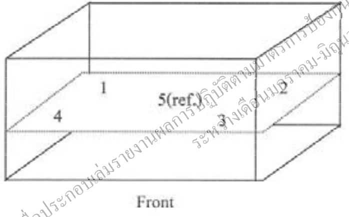
1. Reference standard instrument:-

Instrument	**Model**	**Serial No.**	**Cert. No.**	**Due Date**
1) Data Acquisition	34970A	MY44067817	21LM10	20 Jul 2022

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

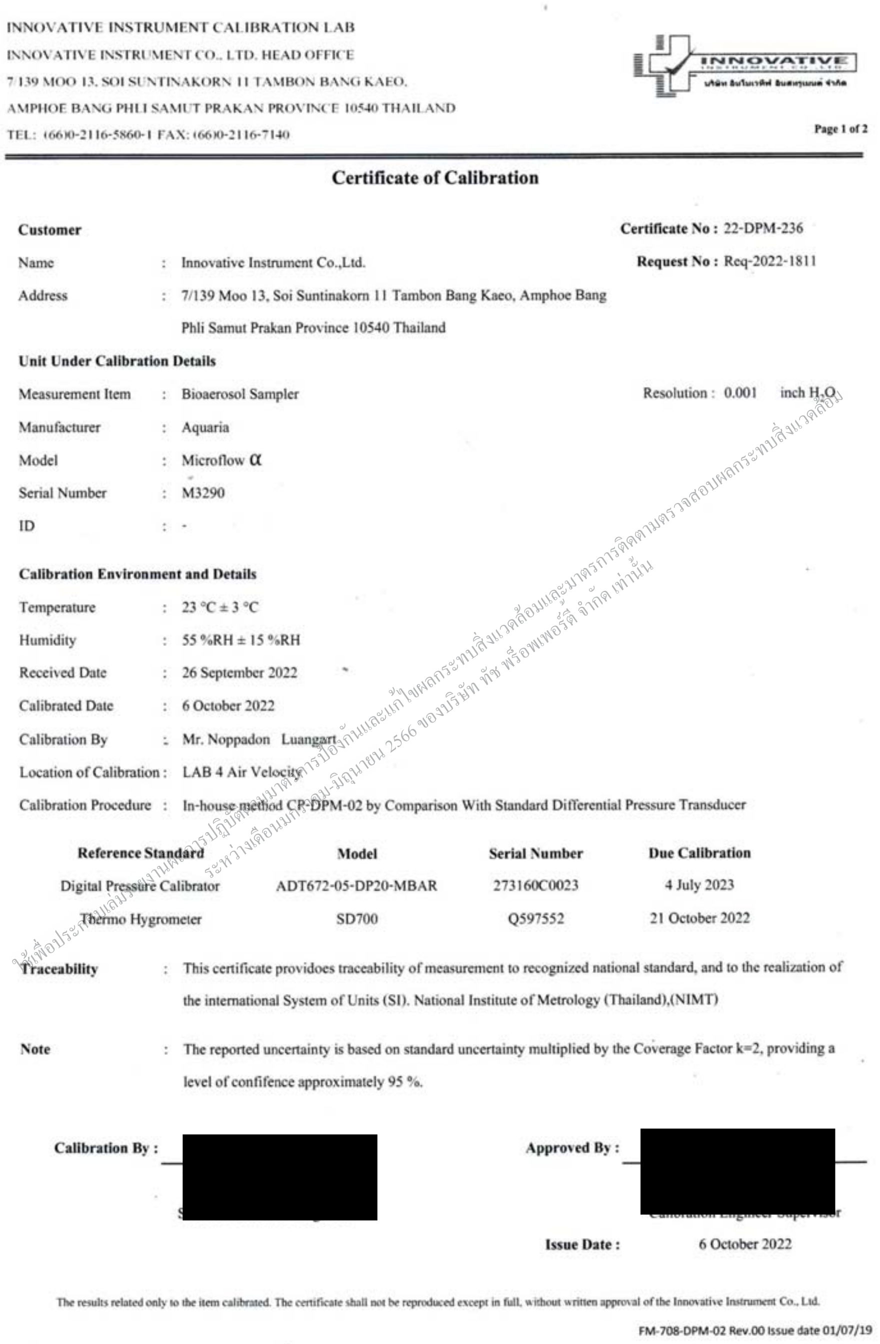
	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	(Volt)
Beginning of Calibration	26	62	220
Finished of Calibration	26	65	220



Position :	**Ref. Std. ID No.:**
1	70RC143
2	70RC144
3	70RC145
4	70RC146
5(ref.)	70RC147

เอกสารไม่ควบคุม

ใช้เพื่อประกอบเล่มรายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อมและมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม
ระหว่างเดือนมกราคม-มิถุนายน 2566 ของบริษัท ทีพี พร็อพเพอร์ตี้ จำกัด เท่านั้น



INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEO,
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140

Page 1 of 2

Certificate of Calibration

Customer

Certificate No : 22-DPM-236
Request No : Req-2022-1811

Name : Innovative Instrument Co.,Ltd.
Address : 7/139 Moo 13, Soi Suntinakorn 11 Tambon Bang Kaeo, Amphoe Bang
Phli Samut Prakan Province 10540 Thailand

Unit Under Calibration Details

Measurement Item : Bioaerosol Sampler
Resolution : 0.001 inch H_2O
Manufacturer : Aquaria
Model : Microflow α
Serial Number : M3290
ID : -

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 26 September 2022
Calibrated Date : 6 October 2022
Calibration By : Mr. Noppadon Luangart
Location of Calibration : LAB 4 Air Velocity
Calibration Procedure : In-house method CP-DPM-02 by Comparison With Standard Differential Pressure Transducer

Reference Standard	Model	Serial Number	Due Calibration
Digital Pressure Calibrator	ADT672-05-DP20-MBAR	273160C0023	4 July 2023
Thermo Hygrometer	SD700	Q597552	21 October 2022

Traceability : This certificate providoes traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI). National Institute of Metrology (Thailand),(NIMT)

Note : The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k=2, providing a level of confifence approximately 95 %.

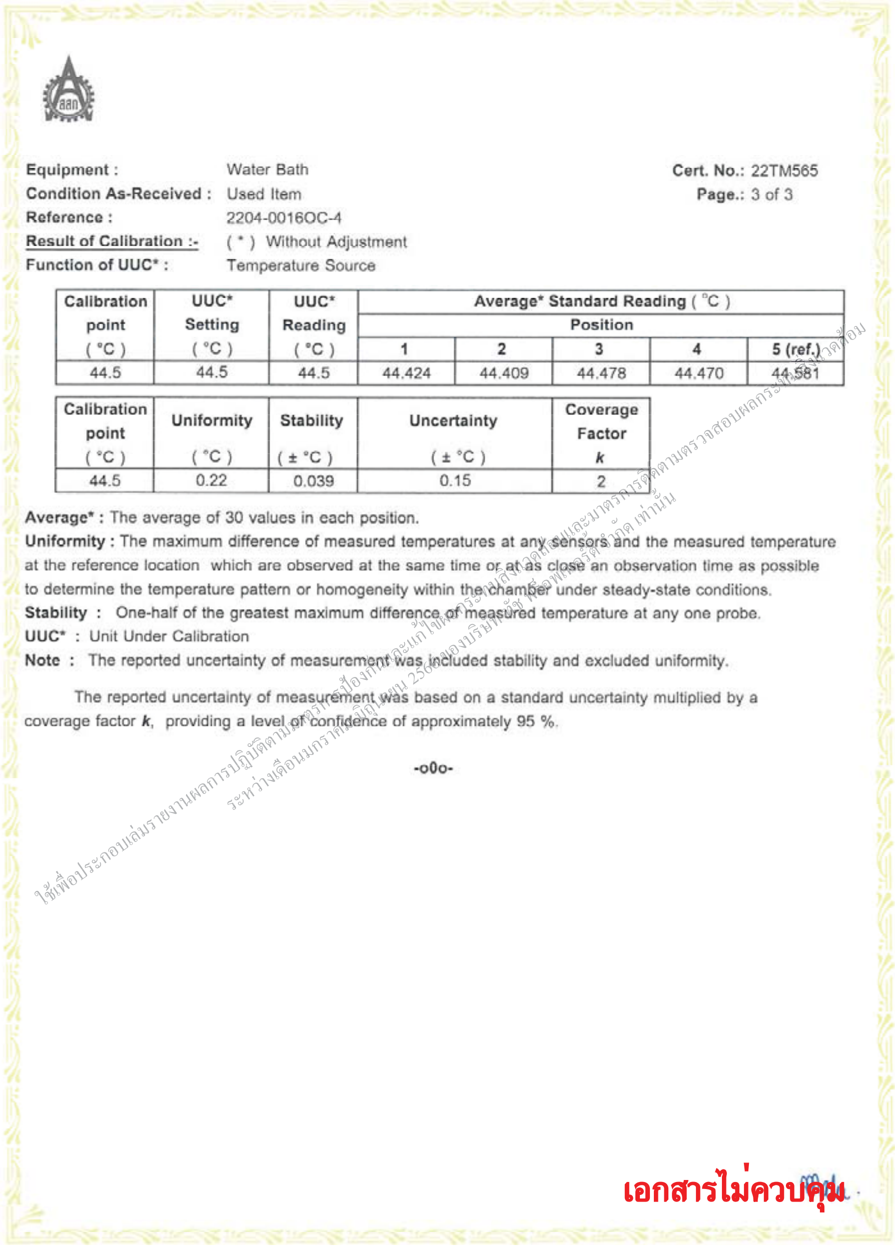
Calibration By : [redacted]

Approved By : [redacted]

Issue Date : 6 October 2022

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

FM-708-DPM-02 Rev.00 Issue date 01/07/19



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2204-0016OC-4
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 22TM565
Page.: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.424	44.409	44.478	44.470	44.581

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor *k*
44.5	0.22	0.039	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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เอกสารไม่ควบคุม

TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
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TEL. 0-2717-3000-24 FAX. 0-2719-9484

NSC-TISI-TIS17025
CALIBRATION 0008

Certificate of Calibration

Certificate No. : 23H487
Page : 1 of 2

Equipment :	Digital Thermo-Hygrometer
Manufacturer:	EXTECH
Model :	448515
Serial No.:	PONPE5899555
ID No.:	TNP.LAB.22
Condition As-Received:	Used Item
Received Date:	02 March 2023
Calibration Date:	07 March 2023
Reference:	2303-0104WN
Ambient Temperature:	(25 ± 3) °C
Relative Humidity:	(50 ± 20) %

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

Submitted by: TNP ENVIRONMENT CO.,LTD.
332/173 Moo 3, Bang Rak Phatthana, Bang Bua Thong,
Nonthaburi 11110

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

Condition of this result of calibration

1.Reference standards instuments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Hygro-M2 Dew Point Monitor	5112	2360195	20703	02 Aug 2023
2) Standard Humidity/Temperature Meter	400	10203027	TH-0082-22	22 Aug 2023

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

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

-National Institute of Standards and Technology (NIST) , The United States of America

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Viporn Tantiyawutti
Issue Date : 10 March 2023

Approved Signatory : [redacted]
[✓] [redacted]
[ ] Pornthippa Tameyakul
[ ] Viporn Tantiyawutti

B 0310048

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7/139 MOO 13, SOI SUNTINAKORN 11 TAMBON BANG KAEO,
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140

INNOVATIVE

Certificate No : 22-DPM-236
Request No : Req-2022-1811

Calibration Results : Without Adjustment

Flow Rate Accuracy

Flow Rate (L/min)	ΔPSETRA (inch H_2O)	Mean STD Reading (inch H_2O)	Error (inch H_2O)		Uncertainty (±) (inch H_2O)
30	0.014	0.014	0.0%	0.0000	0.0012
60	0.050	0.050	0.0%	0.0000	0.0012
90	0.118	0.118	0.0%	0.0000	0.0012
100	0.138	0.138	0.0%	0.0000	0.0012
120	0.206	0.206	0.0%	0.0000	0.0012

Note :
Mean : The average standard of 4 values on each Point
inch H_2O = 249.0889 Pascal
ΔP = Differential Pressure

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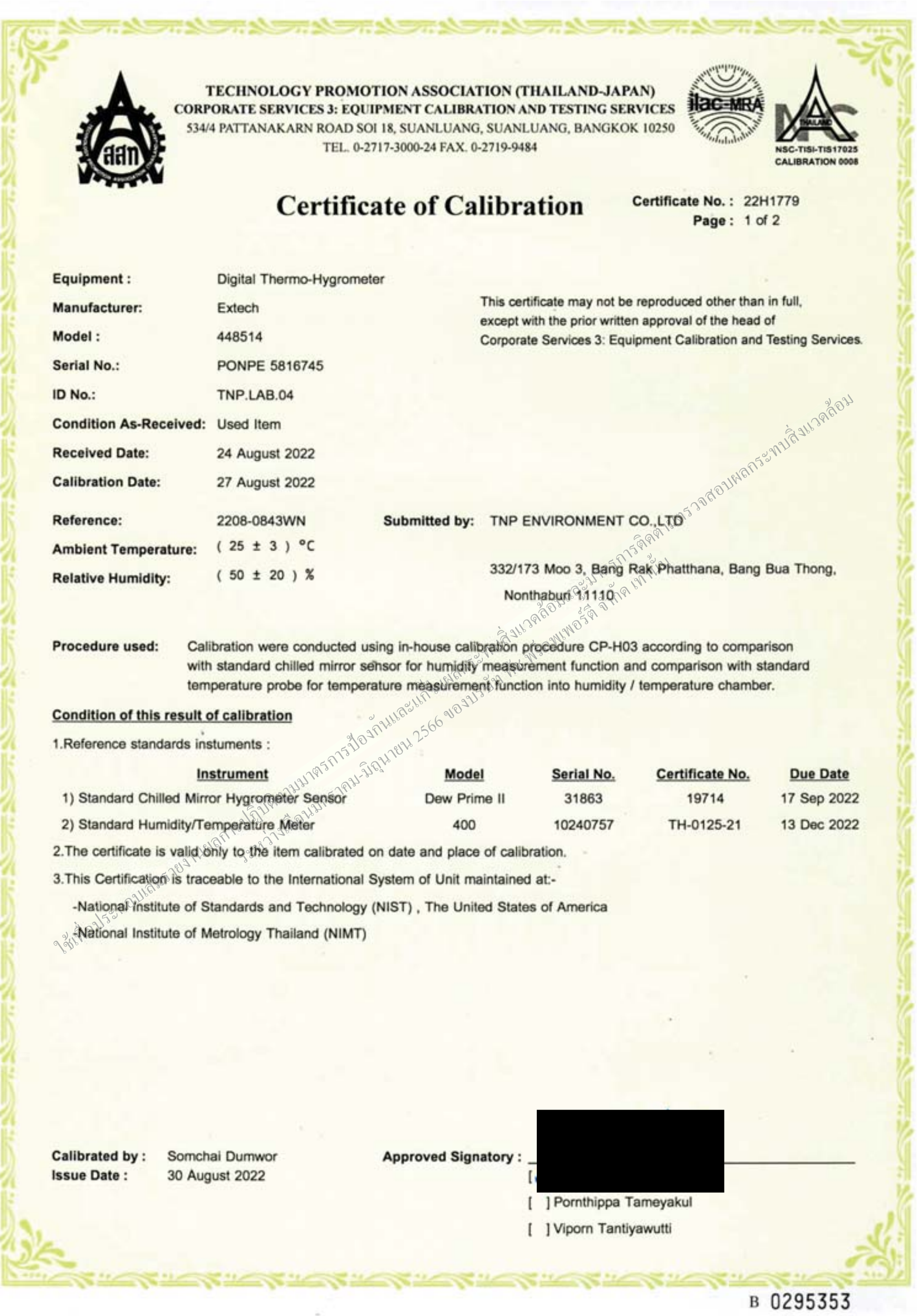
End of Certificate

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



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NSC-TISI-TIS17025
CALIBRATION 0008

Certificate of Calibration

Certificate No. : 22H1779
Page : 1 of 2

Equipment :	Digital Thermo-Hygrometer
Manufacturer:	Extech
Model :	448514
Serial No.:	PONPE 5816745
ID No.:	TNP.LAB.04
Condition As-Received:	Used Item
Received Date:	24 August 2022
Calibration Date:	27 August 2022
Reference:	2208-0843WN
Ambient Temperature:	(25 ± 3) °C
Relative Humidity:	(50 ± 20) %

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

Submitted by: TNP ENVIRONMENT CO.,LTD
332/173 Moo 3, Bang Rak Phatthana, Bang Bua Thong,
Nonthaburi 11110

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

Condition of this result of calibration

1.Reference standards instuments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Chilled Mirror Hygrometer Sensor	Dew Prime II	31863	19714	17 Sep 2022
2) Standard Humidity/Temperature Meter	400	10240757	TH-0125-21	13 Dec 2022

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

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

-National Institute of Standards and Technology (NIST) , The United States of America

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Somchai Dumwor
Issue Date : 30 August 2022

Approved Signatory : [redacted]
[ ] Pornthippa Tameyakul
[ ] Viporn Tantiyawutti

B 0295353

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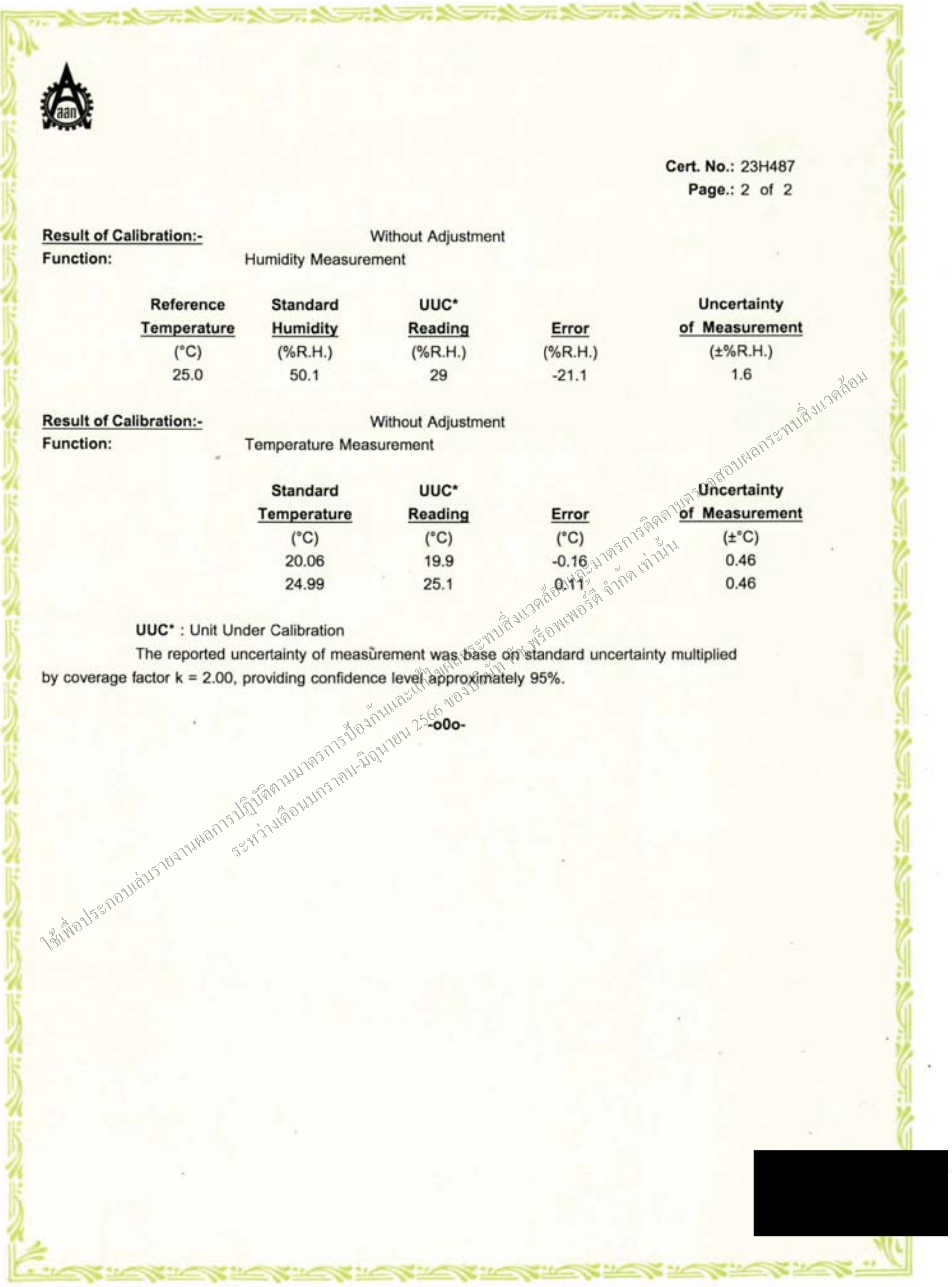

Cert. No.: 23H487
Page.: 2 of 2

Result of Calibration:- Without Adjustment
Function: Humidity Measurement

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	50.1	29	-21.1	1.6

Result of Calibration:- Without Adjustment
Function: Temperature Measurement

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.06	19.9	-0.16	0.46
24.99	25.1	0.11	0.46

UUC* : Unit Under Calibration

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

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[redacted]

a 1152575

ใช้เพื่อประกอบเล่มรายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อมและมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม
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TEL. 0-2717-3000-24 FAX. 0-2719-9484

NSC-TISI-TIS17025
CALIBRATION 0008

Certificate of Calibration

Certificate No. : 23H486
Page : 1 of 2

Equipment :	Digital Thermo-Hygrometer
Manufacturer:	EXTECH
Model :	448515
Serial No.:	PONPE5899554
ID No.:	TNP.LAB.21
Condition As-Received:	Used Item
Received Date:	02 March 2023
Calibration Date:	07 March 2023
Reference:	2303-0104WN
Ambient Temperature:	(25 ± 3) °C
Relative Humidity:	(50 ± 20) %

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Submitted by: TNP ENVIRONMENT CO.,LTD.
332/173 Moo 3, Bang Rak Phatthana, Bang Bua Thong,
Nonthaburi 11110

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

Condition of this result of calibration

1.Reference standards instuments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Hygro-M2 Dew Point Monitor	5112	2360195	20703	02 Aug 2023
2) Standard Humidity/Temperature Meter	400	10203027	TH-0082-22	22 Aug 2023

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

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

-National Institute of Standards and Technology (NIST) , The United States of America
-National Institute of Metrology Thailand (NIMT)

Calibrated by : Viporn Tantiyawutti
Issue Date : 10 March 2023

Approved Signatory : [redacted]
[✓] Chakr
[ ] Pornthippa Tameyakul
[ ] Viporn Tantiyawutti

B 0310047

Cert. No.: 22H1779
Page.: 2 of 2

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

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	50.1	47	-3.1	1.6

Result of Calibration:- Without Adjustment
Function: Temperature measurement for indoor sensor.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.02	20.1	0.08	0.42
25.03	25.4	0.37	0.42

UUC* : Unit Under Calibration

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

-o0o-

[redacted]

a 1123737

Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel: +66 2643 8361-6 , e-mail: service.thailand@sartorius.com

NSC-TISI-TIS 17025
CALIBRATION No.0426

SARTORIUS

Certificate of Calibration

Model Number : SECURA224-1S
Description : Analytical Balance
Serial Number : 41305301
Manufacturer : Sartorius

Certificate No. : 22BCI0160
Issued Date : Tuesday, June 21, 2022
Reference No. : 186783
Page No. : 1 0f 2

Customer Name : TNP Environment Co., Ltd.
332/173 Moo 3,Bang Rak Phatthana Bang Bua Thong, Nonthaburi 11110 Thailand.

Calibrated Place : Weighing Room

Calibrated By : Mr.Chonchai Inthana
Calibration Date : Thursday, June 16, 2022

Calibration Procedure No. : This calibration was conducted by Using in-house calibration procedure number (WI-003) Based on UKAS LAB 14 : 2019

Metrological data :
Capacity : 220 g Readability 0.0001 g

Ambients Conditions:
Temperature : 23.8 °C ± 5.0 °C
Humidity : 66.5 % RH ± 10.0 % RH
Pressure _ ± _

Reasons for calibration
☐ New Installation ☐ Service / Repaired ☑ Re-calibration/ Maintenance

Equipment Condition: ☑ Good Operate ☐ Fair

Measurement Method UKAS Publication Ref :Lab 14

The measurement uncertainty stated is the expended 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). The calibration certificate documents the traceability to National Standards, which realise the unit of measurement according to the International Standard System of Units (SI).

Traceability:

Model Number	Description	Traceability	Ceticifate No.	Due Date
YCS011-522-00	Sartorius weight set 1mg - 5000g E2,YCS011-522-00	SPC-RT	C02212565	14-Sep-2023
MHB-382SD	Humidity/Barometer/Temp Lutron MHB-382SD	SPC-RT	C19210498	31-Aug-2022

This certificate relate and apply this equipment only.

This certificate may not be reproduced other than in full except with the prior written approval of the Verification Operation Division Sartorius (Thailand) Co., Ltd.

Mr.Chonchai Inthana(Technical Manager)

STAMP

SARTORIUS (THAILAND) CO., LTD. CAL sartorius ISO/IEC 17025 Cert no. 13007 / C219

SOP FM 33 03 February 2022

Cert. No.: 23H486
Page.: 2 of 2

Result of Calibration:- Without Adjustment
Function: Humidity Measurement

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (±%R.H.)
25.0	50.1	48	-2.1	1.6

Result of Calibration:- Without Adjustment
Function: Temperature Measurement

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (±°C)
20.06	19.7	-0.36	0.46
24.99	24.9	-0.09	0.46

UUC* : Unit Under Calibration

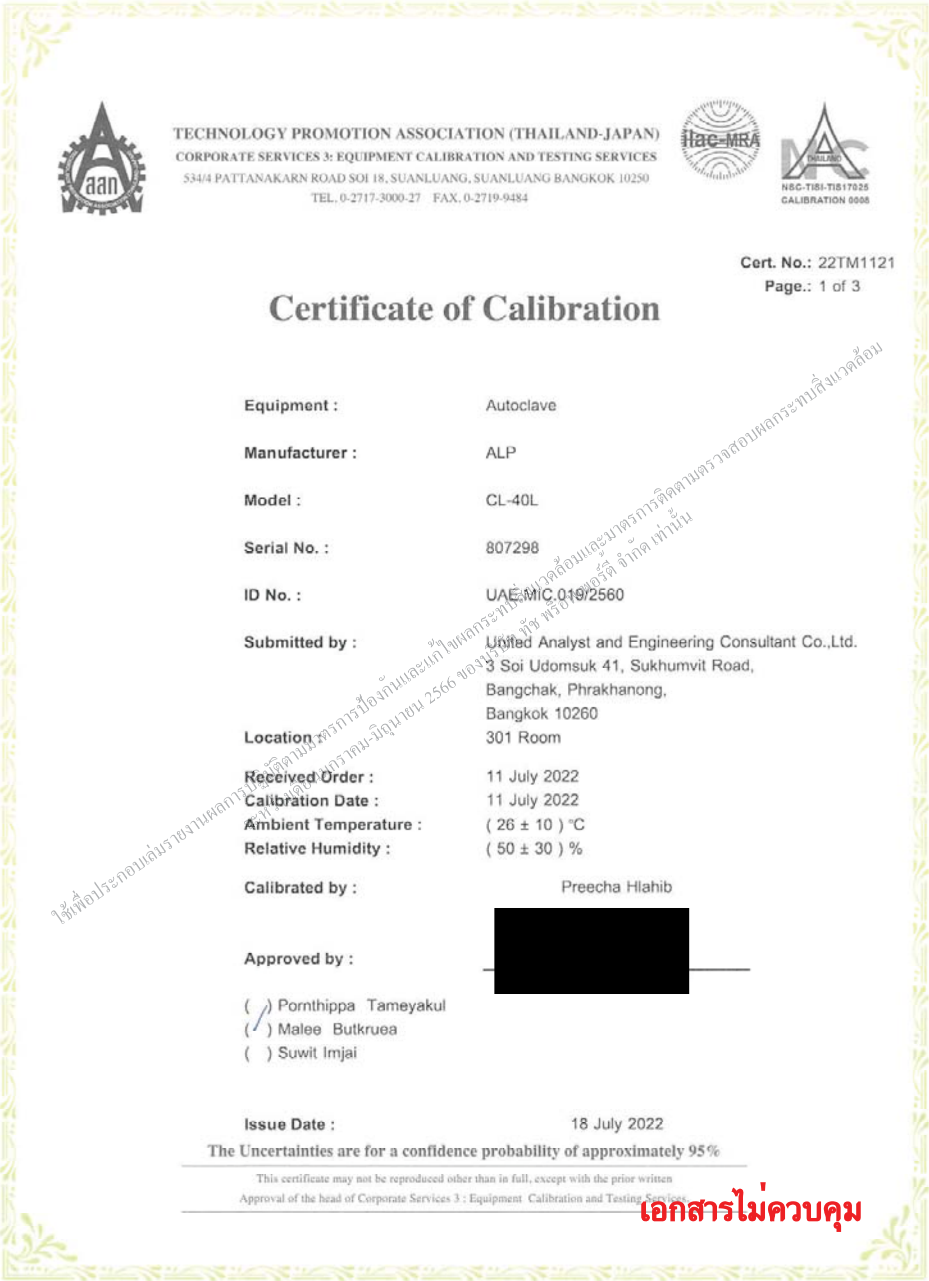
The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor k = 2.00, providing confidence level approximately 95%.

-o0o-

[redacted]

a 1152576

ใช้เพื่อประกอบเล่มรายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อมและมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม ระหว่างเดือนมกราคม-มิถุนายน 2566 ของบริษัท [illegible] พร็อพเพอร์ตี้ จำกัด เท่านั้น



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

NSC-TISI-TIS17025
CALIBRATION 0008

Cert. No.: 22TM1121
Page.: 1 of 3

Certificate of Calibration

Equipment : Autoclave

Manufacturer : ALP

Model : CL-40L

Serial No. : 807298

ID No. : UAE.MIC.019/2560

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

Location : 301 Room

Received Order : 11 July 2022
Calibration Date : 11 July 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Preecha Hlahib

Approved by : [redacted]

(/) Pornthippa Tameyakul
(/) Malee Butkruea
( ) Suwit Imjai

Issue Date : 18 July 2022

The Uncertainties are for a confidence probability of approximately 95%

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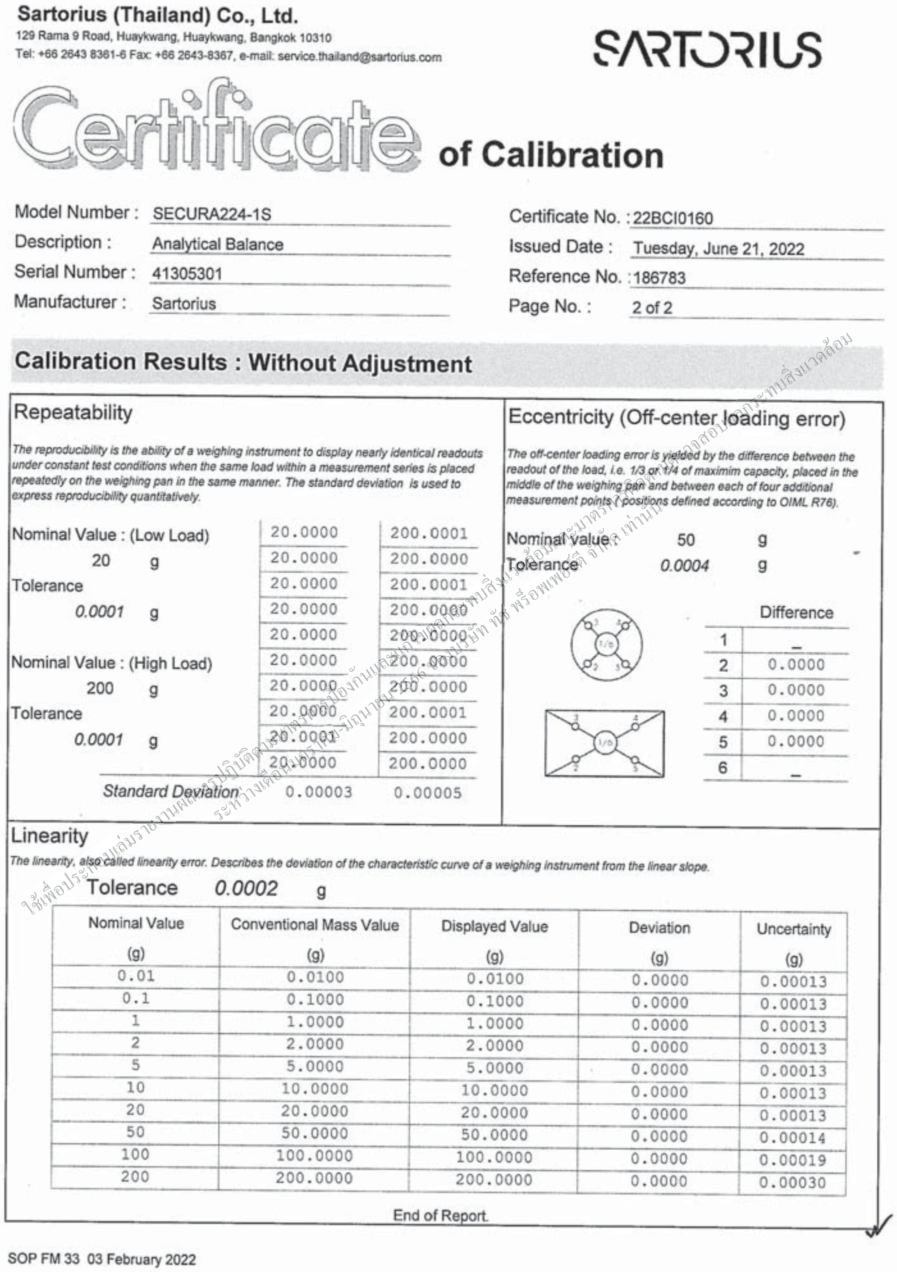
เอกสารไม่ควบคุม



Sartorius (Thailand) Co., Ltd.
129 Rama 9 Road, Huaykwang, Huaykwang, Bangkok 10310
Tel: +66 2643 8361-6 Fax: +66 2643-8367, e-mail: service.thailand@sartorius.com

SARTORIUS

Certificate of Calibration

Model Number : SECURA224-1S
Description : Analytical Balance
Serial Number : 41305301
Manufacturer : Sartorius

Certificate No. : 22BCI0160
Issued Date : Tuesday, June 21, 2022
Reference No. : 186783
Page No. : 2 of 2

Calibration Results : Without Adjustment

Repeatability

The reproducibility is the ability of a weighing instrument to display nearly identical readouts under constant test conditions when the same load within a measurement series is placed repeatedly on the weighing pan in the same manner. The standard deviation is used to express reproducibility quantitatively.

Nominal Value : (Low Load) 20 g
Tolerance *0.0001* g

Nominal Value : (High Load) 200 g
Tolerance *0.0001* g

20.0000	200.0001
20.0000	200.0000
20.0000	200.0001
20.0000	200.0000
20.0000	200.0000
20.0000	200.0000
20.0000	200.0000
20.0000	200.0001
20.0001	200.0000
20.0000	200.0000
Standard Deviation 0.00003	0.00005

Eccentricity (Off-center loading error)

The off-center loading error is yielded by the difference between the readout of the load, i.e. 1/3 or 1/4 of maximim capacity, placed in the middle of the weighing pan and between each of four additional measurement points (positions defined according to OIML R76).

Nominal value : 50 g
Tolerance *0.0004* g

	Difference
1	–
2	0.0000
3	0.0000
4	0.0000
5	0.0000
6	–

Linearity

The linearity, also called linearity error. Describes the deviation of the characteristic curve of a weighing instrument from the linear slope.

Tolerance *0.0002* g

Nominal Value (g)	Conventional Mass Value (g)	Displayed Value (g)	Deviation (g)	Uncertainty (g)
0.01	0.0100	0.0100	0.0000	0.00013
0.1	0.1000	0.1000	0.0000	0.00013
1	1.0000	1.0000	0.0000	0.00013
2	2.0000	2.0000	0.0000	0.00013
5	5.0000	5.0000	0.0000	0.00013
10	10.0000	10.0000	0.0000	0.00013
20	20.0000	20.0000	0.0000	0.00013
50	50.0000	50.0000	0.0000	0.00014
100	100.0000	100.0000	0.0000	0.00019
200	200.0000	200.0000	0.0000	0.00030

End of Report.

SOP FM 33 03 February 2022

Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2207-0245OC-7

Cert. No.: 22TM1121
Page.: 3 of 3

Result of Calibration :- (*) Without Adjustment

Operating parameter Set : Temperature = 115 °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*
116	116	1	116.523	0.14	0.08	0.90	2
		2	116.566				
		3	116.440				

Operating parameter Set : Temperature = 121 °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*
122	122	1	122.503	0.19	0.12	0.91	2
		2	122.637				
		3	122.558				

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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เอกสารไม่ควบคุม

Equipment : Autoclave
Condition As-Received : Used Item
Reference : 2207-0245OC-7

Cert. No.: 22TM1121
Page.: 2 of 3

Procedure Used :-

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

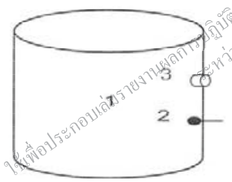
1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44060450	22LM46	28 Mar 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 directy 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	29	49	220
Finished of Calibration	32	48	220

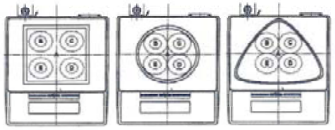
Position	Description	Ref. Std. ID No.:
1 =	Center of chamber	22-14TC-01
2 =	Temperature sensor	22-14TC-02
3 =	Exhaust port	22-14TC-03

เอกสารไม่ควบคุม

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

Certificate of Calibration

Equipment:	Balance	Certificate No.:	C01223732
Model:	PX623	Issued Date:	09 December 2022
Serial No. (or ID.):	C236754745	Job No.:	KSPR2215576
Manufacturer:	Ohaus	Page:	1 of 2
Condition:	New		

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 Mircobiology 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. C02221765

[redacted]
Person in charge

[redacted]
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.

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 Simple 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

[redacted]

Statements of conformity:

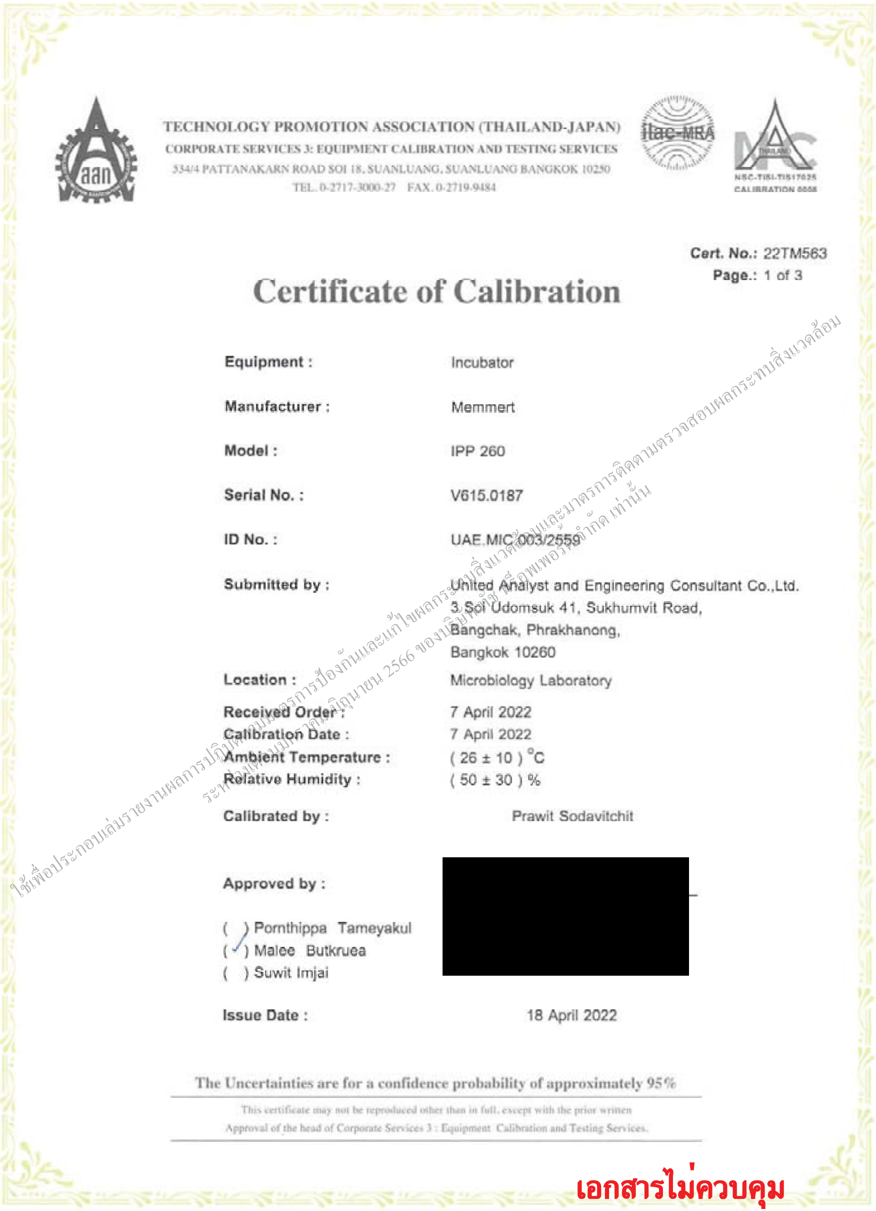
Without Adjustment

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



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TEL. 0-2717-3000-27 FAX. 0-2719-9484

Cert. No.: 22TM563
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 : 7 April 2022
Calibration Date : 7 April 2022
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Prawit Sodavitchit

Approved by : [redacted]

( ) Pornthippa Tameyakul
(✓) Malee Butkruea
( ) Suwit Imjai

Issue Date : 18 April 2022

The Uncertainties are for a confidence probability of approximately 95%

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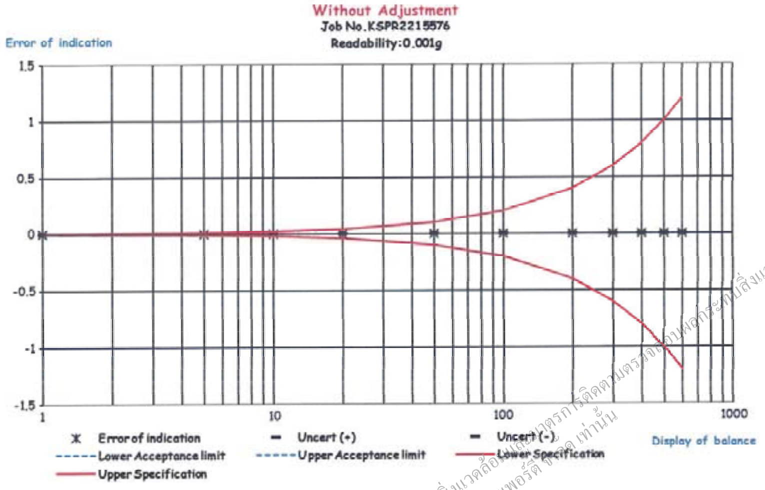

เอกสารไม่ควบคุม

Equipment : Incubator
Condition As-Received : Used Item
Reference : 2204-0016OC-1

Cert. No.: 22TM563
Page.: 3 of 3

Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Uncertainty (±°C)	Coverage Factor *k*
35.0	35.0	35.0	0.12	0.53	0.79	0.30	2

Calibration Point (°C)	Measured Temperature (°C)								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
35.0	35.170	35.167	34.938	34.844	34.816	34.854	34.584	34.730	34.780

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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ใช้เพื่อประกอบเล่มรายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อมและมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม
ระหว่างเดือนมกราคม-มิถุนายน 2566 ของบริษัท [illegible] จำกัด เท่านั้น

[redacted]

Equipment : Incubator
Condition As-Received : Used Item
Reference : 2204-0016OC-1

Cert. No.: 22TM563
Page.: 2 of 3

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

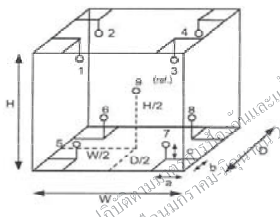
1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Data Acquisition	34970A	MY44067817	21LM10	20 Jul 2022

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)	26	26
REL.Humid. (%)	60	62
AC Supply (Volt)	220	220



Position :	Ref. Std. ID No.:
1	15RTD2/11
2	15RTD2/12
3	15RTD2/13
4	15RTD2/14
5	15RTD2/15
6	15RTD2/16
7	15RTD2/17
8	15RTD2/18
9 (ref.)	15RTD2/19

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 m³

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ระหว่างเดือนมกราคม-มิถุนายน 2566 ของบริษัท [illegible] จำกัด เท่านั้น

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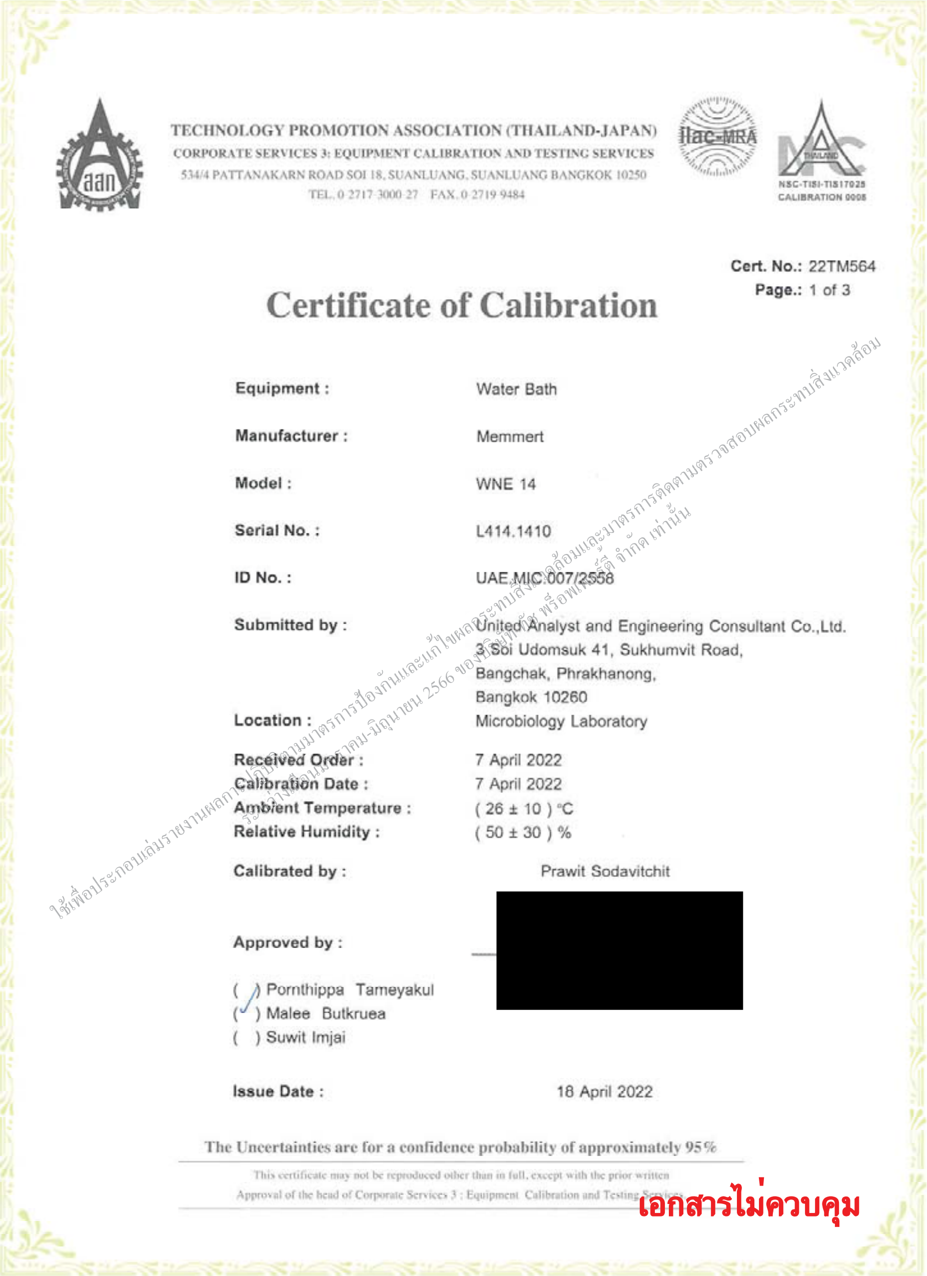

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TEL. 0 2717 3000 27 FAX. 0 2719 9484

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NSC-TISI-TIS17025
CALIBRATION 0008

Cert. No.: 22TM564
Page.: 1 of 3

Certificate of Calibration

Equipment :	Water Bath
Manufacturer :	Memmert
Model :	WNE 14
Serial No. :	L414.1410
ID No. :	UAE.MIC.007/2558
Submitted by :	United Analyst and Engineering Consultant Co.,Ltd. 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Location :	Microbiology Laboratory
Received Order :	7 April 2022
Calibration Date :	7 April 2022
Ambient Temperature :	(26 ± 10) °C
Relative Humidity :	(50 ± 30) %
Calibrated by :	Prawit Sodavitchit
Approved by :	[redacted]

( ) Pornthippa Tameyakul
(✓) Malee Butkruea
( ) Suwit Imjai

Issue Date : 18 April 2022

The Uncertainties are for a confidence probability of approximately 95%

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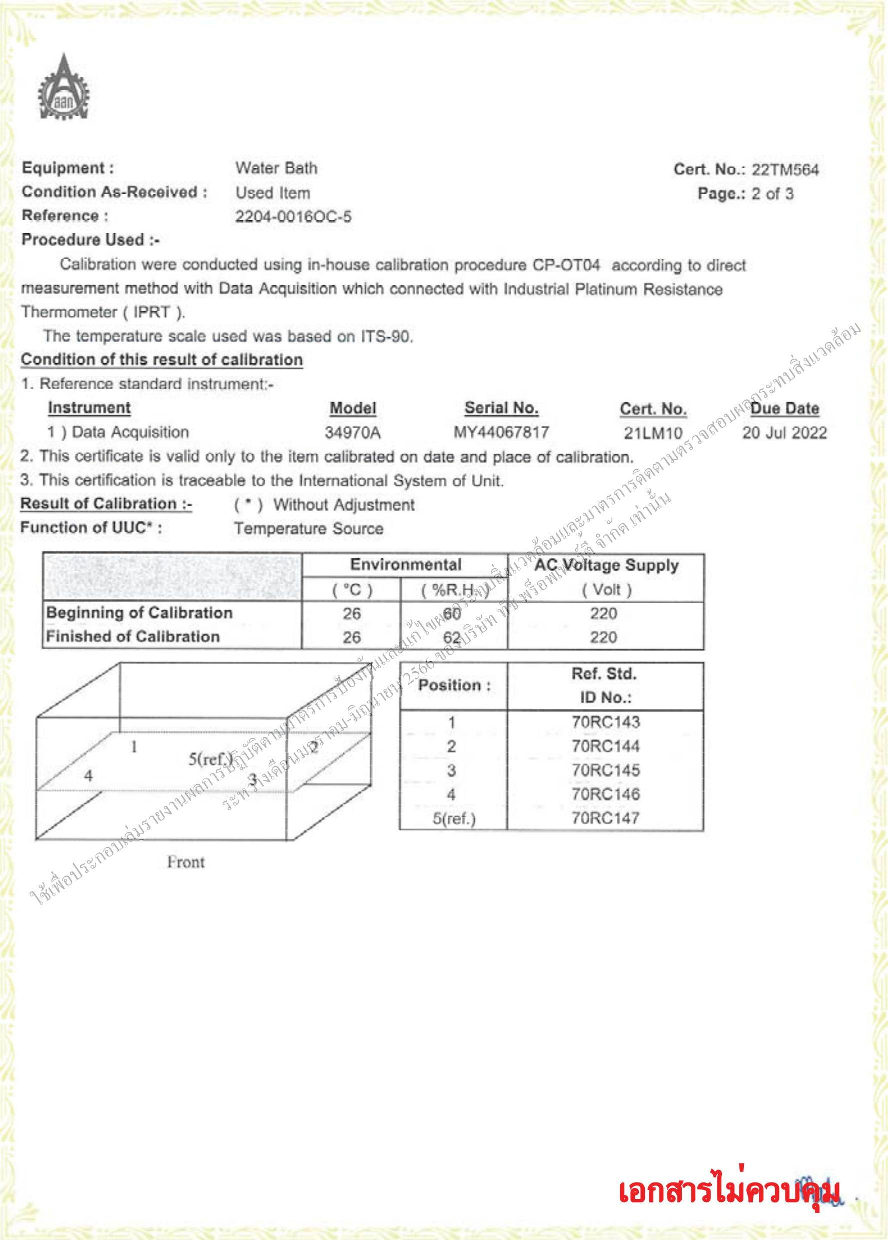


Equipment :	Water Bath	**Cert. No.:** 22TM564
Condition As-Received :	Used Item	**Page.:** 2 of 3
Reference :	2204-0016OC-5	

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	34970A	MY44067817	21LM10	20 Jul 2022

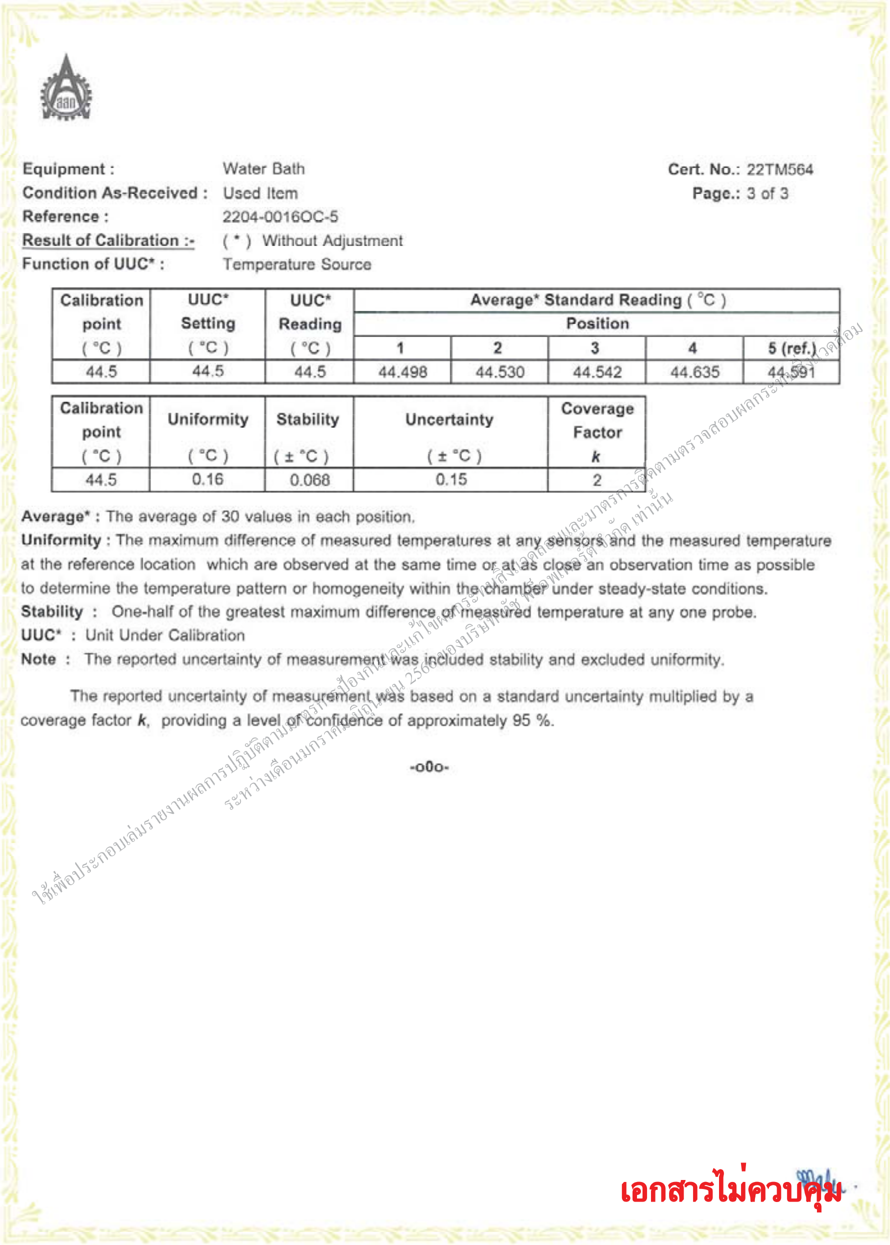
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

	Environmental		AC Voltage Supply
	(°C)	(%R.H)	(Volt)
Beginning of Calibration	26	60	220
Finished of Calibration	26	62	220

Position :	Ref. Std. ID No.:
1	70RC143
2	70RC144
3	70RC145
4	70RC146
5(ref.)	70RC147

เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2204-0016OC-5
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 22TM564
Page.: 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)				
			Position				
			1	2	3	4	5 (ref.)
44.5	44.5	44.5	44.498	44.530	44.542	44.635	44.591

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Uncertainty (± °C)	Coverage Factor *k*
44.5	0.16	0.068	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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ใช้เพื่อประกอบเล่มรายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อมและมาตรการติดตามตรวจสอบผลกระทบสิ่งแวดล้อม
ระหว่างเดือนมกราคม-มิถุนายน 2566 ของบริษัท [illegible] จำกัด เท่านั้น