

### Site and Calibration Information

<b>Location</b> : TNP Envirovmentat	<b>Date</b> : September 15, 2021
<b>Serial</b> : TNP-F-01-TSP	<b>Tech</b> : Mr.Tanawat Ngaowattana

### Site Conditions


<b>Barometric Pressure (mmHg)</b> : 754	<b>Corrected Pressure (mmHg)</b> : 754
<b>Temperature (deg C)</b> : 33	<b>Temperature (deg K)</b> : 306
<b>Average Press.(mmHg)</b> : 754	<b>Corrected Average (mmHg)</b> : 754
<b>Average Temp.(deg C)</b> : 33	<b>Average Temp.(deg K)</b> : 306


### Calibration Orifice

<b>Make</b> : Tish Environment	<b>Qstd Slope</b> : 1.62970
<b>Model</b> : TE-5028A	<b>Qstd Intercept</b> : 0.00443
<b>Serial</b> : 3945	<b>Date Certified</b> : July 29, 2021

### Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (Chart)	IC (Corrected)	Linear Regression Slope : 28.3339 Intercept : 6.0287 Corr. Coeff : 0.9999 # of Observation : 5
1	7.25	1.620	53.0	52.06	
2	5.85	1.455	48.0	47.15	
3	4.55	1.283	43.0	42.24	
4	3.35	1.100	38.0	37.33	
5	2.40	0.931	33.0	32.42	

**Calibrate By** :   
(Mr.Tanawat Ngaowattana)

**Approved By** :   
(Mr.Nuttachai Triprawat)

### Site and Calibration Information

<b>Location</b> : TNP Envirovmemtal	<b>Date</b> : September 15, 2021
<b>Serial</b> : TNP-F-02-TSP	<b>Tech</b> : Mr.Tanawat Ngaowattana

### Site Conditions

<b>Barometric Pressure (mmHg)</b> : 756	<b>Corrected Pressure (mmHg)</b> : 756
<b>Temperature (deg C)</b> : 32	<b>Temperature (deg K)</b> : 305
<b>Average Press.(mmHg)</b> : 756	<b>Corrected Average (mmHg)</b> : 756
<b>Average Temp.(deg C)</b> : 32	<b>Average Temp.(deg K)</b> : 305


### Calibration Orifice

<b>Make</b> : Tish Environment	<b>Qstd Slope</b> : 1.62970
<b>Model</b> : TE-5028A	<b>Qstd Intercept</b> : 0.00443
<b>Serial</b> : 3945	<b>Date Certified</b> : July 29, 2021

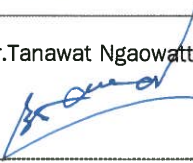
### Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (Chart)	IC (Corrected)	Linear Regression Slope : 31.2021 Intercept : 1.8583 Corr. Coeff : 0.9995 # of Observatio : 5
1	7.15	1.165	53.0	52.25	
2	5.75	1.448	48.0	47.32	
3	4.50	1.281	42.0	41.41	
4	3.20	1.079	36.0	35.49	
5	2.30	0.915	31.0	30.56	

Calibrate By :

  
(Mr.Tanawat Ngaowattana)

Approved By :

  
(Mr.Nuttachai Triprawat)

### Site and Calibration Information


Site		Calibration Orifice	
Location	: TNP Environment Co.,Ltd.	Make	: Tish Environmental
Date	: September 15, 2021	Model	: TE-5028A
Tech	: Mr.Tanawat Ngaowattana	Serial	: 3945
Serial	: TNP-F-01-PM10	Qa Slope (m)	: 1.02049
VFC G-Factor	: 0.09070202	Qa Int (b)	: 0.00279
		Calibrate Due Date	: July 29, 2021

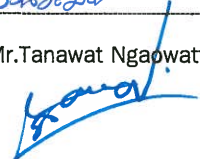
### Ambient Conditions

Temp (deg F)	: 86.0		
Ta (deg K)	: 303	Barometric Pressure (In Hg)	: 29.8
Ta (deg C)	: 30.0	Pa (mm Hg)	: 756.9

### Ambient Conditions

Run Number	Orifice "H2O	Qa M3/min	Sampler "H2O	Pf mm Hg	Po/Pa	Calculated m3/min	% of Diff
1	4.20	1.268	4.20	7.838	0.990	1.306	3.08
2	4.15	1.260	5.30	9.891	0.987	1.303	3.33
3	4.15	1.260	6.10	11.384	0.985	1.300	3.17
4	4.15	1.260	6.50	12.131	0.984	1.299	3.02
5	4.10	1.253	7.50	13.997	0.982	1.295	3.35

Calibrate By :   
(Mr.Tanawat Ngaowattana)

Approved By :   
(Mr.Nuttachai Triprawat)

### Site and Calibration Information

Site		Calibration Orifice	
Location	: TNP Environment Co.,Ltd.	Make	: Tish Environmental
Date	: September 15, 2021	Model	: TE-5028A
Tech	: Mr.Tanawat Ngaowattana	Serial	: 3945
Serial	: TNP-F-04-PM10	Qa Slope (m)	: 1.02049
VFC G-Factor	: 0.09070202	Qa Int (b)	: 0.00279
		Calibrate Due Date	: July 29, 2021

### Ambient Conditions

Temp (deg F)	: 85.5		
Ta (deg K)	: 303	Barometric Pressure (in Hg)	: 29.7
Ta (deg C)	: 29.7	Pa (mm Hg)	: 754.4

### Ambient Conditions

Run	Orifice	Qa	Sampler	Pf		Calculated	% of
Number	"H2O	M3/min	"H2O	mm Hg	Po/Pa	m3/min	Diff
1	4.20	1.269	3.00	5.599	0.993	1.310	3.23
2	4.20	1.269	3.50	6.532	0.991	1.308	3.07
3	4.15	1.262	4.20	7.838	0.990	1.306	3.49
4	4.10	1.254	5.40	10.078	0.987	1.302	3.83
5	4.00	1.239	9.80	18.289	0.976	1.287	3.87





## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

42 รามอินทรา 14 ยอก 9 แขวงจันทบุรี เขตบางเขน กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
 บริษัท เอ็นไวร์ เซอร์วิส จำกัด  
 ENVIR SERVICE CO., LTD. 42 Ramintra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 17 August 2021

#### Instruments Information

Analyzer Type: CO Analyzer Model: 48C	Manufacturer Thermo Environmental S/N: 48CHL-67713-358
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#### Calibration System

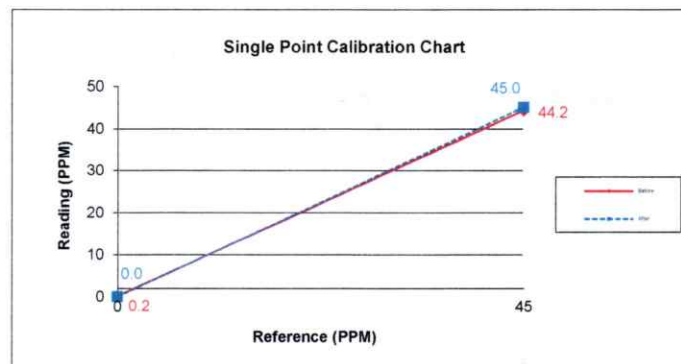
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.2	0.2	45.0	44.2	-1.7
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By:

Mr. PASAGORN SAMOL





บริษัท เอ็นไวร์ เซอร์วิส จำกัด  
ENVIR SERVICE CO., LTD.

## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201

42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 06 August 2021

#### Instruments Information

Analyzer Type: NO/NO <sub>2</sub> /NO <sub>x</sub> Analyzer Model: 42C	Manufacturer Thermo Environmental S/N: 0413406269
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#### Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1924	NO Conc 55.47 PPM SO <sub>2</sub> Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

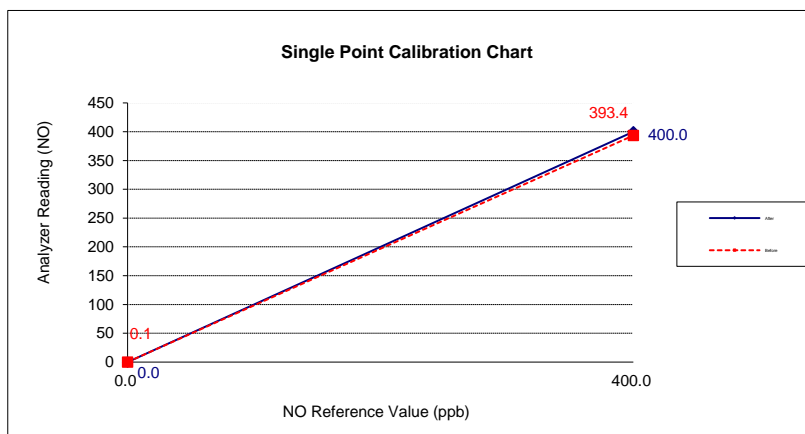
Humidity: 51 %RH

#### Calibration Check ( Before adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	393.4	400.0	-1.7
NO <sub>x</sub>	0.1	0.0	0.1	397.3	400.0	-0.7

#### Calibration Check ( After adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NO <sub>x</sub>	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By : Mr. Pasagorn Samol



## บริษัท เอ็นไวร์ เซอร์วิส จำกัด

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

### Analyzer Performance Test

Calibrated Date: 07 August 2021

#### Instruments Information

Analyzer Type: SO2 Analyzer Model: 43C	Manufacturer Thermo Environmental S/N: 0327402325
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#### Calibration System

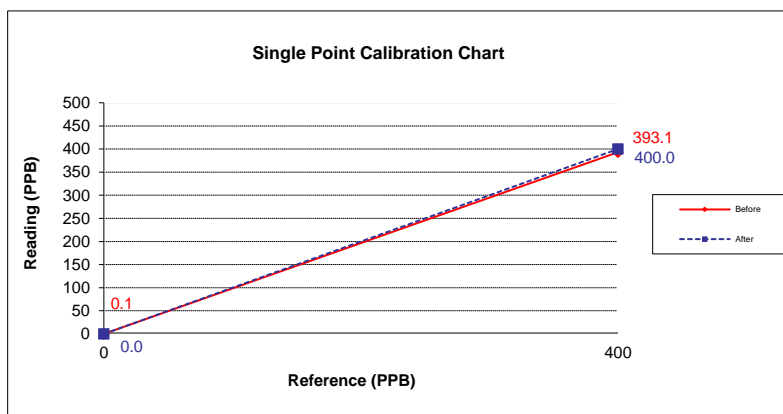
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	393.1	-1.7
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

Mr.PASAGORN SAMOL



## Certificate of Calibration

Certificate Number : SPR21070118-1

Page : 1 of 3

Customer : TNP ENVIRONMENT CO.,LTD.

332/173 Moo.3, Bang Rak Phatthana, Bang Bua Thong, Nonthaburi  
11110

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6226

Serial Number : 170131

ID. Number : TNP-F-S01

### Environmental Conditions

Ambient Temperature :  $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Relative Humidity :  $50\% \pm 15\%$

Location of Calibration : In-Lab

Calibration Procedure : SP-CPE-04-01

Received Date : 08 Jul 2021

Calibration Date : 09 Jul 2021

Recommend Due Date : 09 Jul 2022

Date of Issue : 10 Jul 2021

### Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Chumpon Dokpikul

Calibration Officer

Approved by :

( Mr.Worapong Sinthusopa )

Authorized Signatory



## Calibration Report

Certificate Number : SPR21070118-1

Page : 2 of 3

### Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	SC-942	B014059	EEL.BP.19/1063	15 Oct 2021

### Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research





## Result of Calibration

Certificate No. : SPR21070118-1

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty ( ± )
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty ( ± )
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Select F

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty ( ± )
	Fast	Slow	Fast	Slow	
94	94.1	94.1	0.1	0.1	0.15
114	113.8	113.8	-0.2	-0.2	0.15

### Note:

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2.00$ , providing a level of confidence approximately 95%.

- End of Certificate -



## Certificate of Calibration

Certificate Number : SPR21070118-3

Page : 1 of 3

Customer : TNP ENVIRONMENT CO.,LTD.

332/173 Moo.3, Bang Rak Phatthana, Bang Bua Thong, Nonthaburi  
11110

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6226

Serial Number : 170116

ID. Number : TNP-F-S03

### Environmental Conditions

Ambient Temperature :  $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 08 Jul 2021

Relative Humidity :  $50\% \pm 15\%$

Calibration Date : 09 Jul 2021

Location of Calibration : In-Lab

Recommend Due Date : 09 Jul 2022

Calibration Procedure : SP-CPE-04-01

Date of Issue : 10 Jul 2021

### Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Chumpon Dokpikul

Calibration Officer

Approved by :

( Mr.Worapong Sinthusopa )

Authorized Signatory





## Result of Calibration

Certificate No. : SPR21070118-3

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty ( ± )
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty ( ± )
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Select F

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty ( ± )
	Fast	Slow	Fast	Slow	
94	94.1	94.1	0.1	0.1	0.15
114	113.8	113.8	-0.2	-0.2	0.15

### Note:

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2.00$ , providing a level of confidence approximately 95%.

- End of Certificate -





## Calibration Report

Certificate Number : SPR21070118-3

Page : 2 of 3

### Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	SC-942	B014059	EEL.BP.19/1063	15 Oct 2021

### Traceability

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

TISTR - Thailand Institute of Scientific and Technological Research



# Calibration Certificate


Part Number: 721A2601  
Description: Micromate with DIN Geophone  
Serial Number: UM19128  
Calibration Date: **NOV 30 2021**  
Calibration Reference Equipment: 714J7402

*Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.*

*Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.*

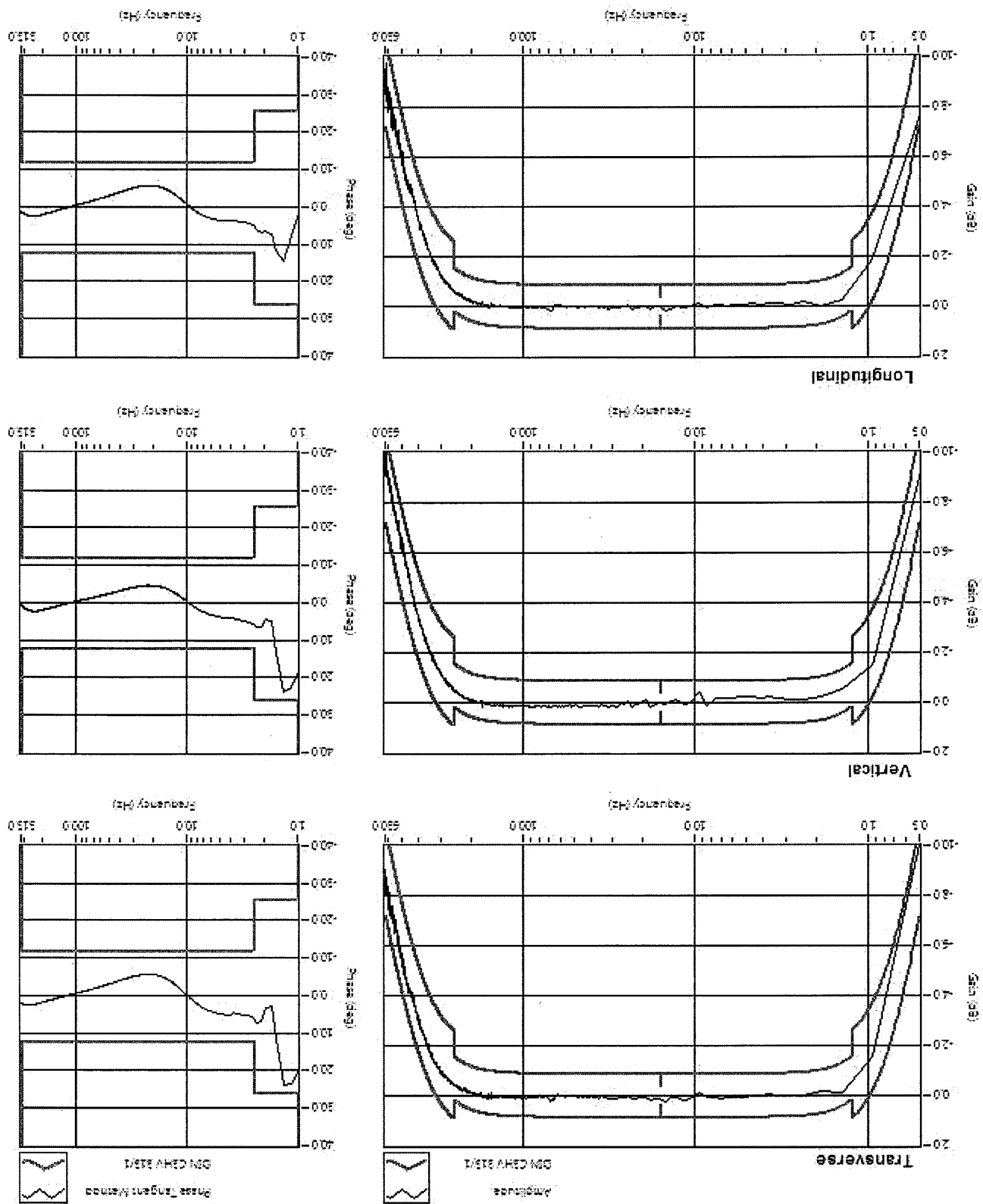
*The environment in which this product was calibrated is maintained within the operating specifications of the instrument.*

*Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.*

Calibrated By:   
Xiaoming Yang

 **Instantel** 309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642

# Frequency Response of UM19128





# Calibration Certificate

Part Number: 721A0201

Description: Micromate ISEE Linear Microphone

Serial Number: UL5389

Calibration Date: NOV 30 2021

Calibration Reference Equipment: 714J7402

*The equipment identified above meet or exceeds the International Society of Explosives Engineers (ISEE) 2017 Performance Specification for Blasting Seismographs.*

*Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.*

*Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.*

*The environment in which this product was calibrated is maintained within the operating specifications of the instrument.*

*Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.*

Calibrated By: \_\_\_\_\_

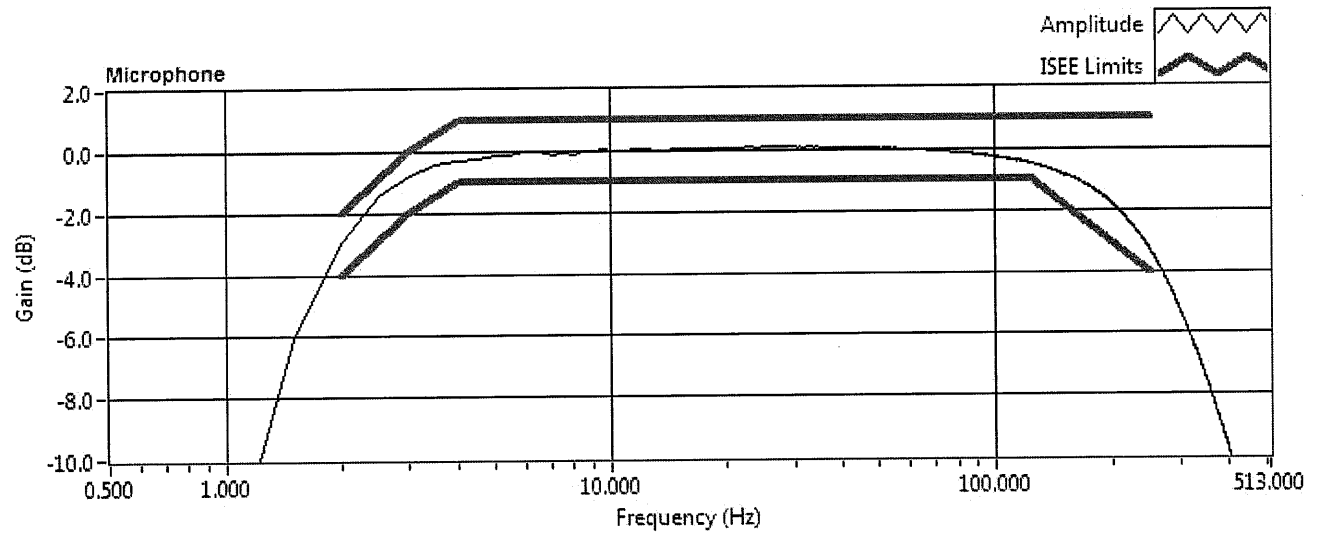
Ninh Nguyen



**Instantel®**

309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642

# Amplitude Frequency Response of UL5389







## Certificate of Calibration

Certificate Number : SPR22030059-2

Page : 1 of 3

Customer : TNP ENVIRONMENT CO.,LTD.

332/173 Moo.3, Bang Rak Phatthana, Bang Bua Thong, Nonthaburi  
11110

Equipment Name : Digital Thermo-Hygrometer

Manufacturer : Extech

Model : 445815

Serial Number : PONPE5899555

ID. Number : TNP.LAB.22

### Environmental Conditions

Ambient Temperature :  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Received Date : 03 Mar 2022

Relative Humidity :  $50\% \pm 15\%$

Calibration Date : 07 Mar 2022

Location of Calibration : In-Lab

Recommend Due Date : 07 Mar 2023

Calibration Procedure : SP-CPT-04-13

Date of Issue : 08 Mar 2022

### Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr. Navaporn Uengseng

Approved by :

Calibration Officer

( Mr. Worapong Sinthusopa )

Authorized Signatory



## Calibration Report

Certificate Number : SPR22030059-2

Page : 2 of 3

### Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Humidity Chamber	TH-80S	N/A	SPR22010401-8	05 Mar 2023
THERMO-HYGROMETER	5020A	A47046	QR22-0191	02 Feb 2023

### Traceability

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

SP Metrology - SP Metrology system (Thailand) Co.Ltd.

Quality Reborn Co., Ltd



## Result of Calibration

Certificate No. : SPR22030059-2

Page : 3 of 3

Temperature Accuracy in the Measurement.

Unit : °C

Temperature Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
20.0	20.014	20.5	0.486	0.50
25.0	25.012	25.5	0.488	0.50

Humidity Accuracy in the Measurement. (25 °C)

Unit : %RH

Humidity Setting	Standard Reading	UUC Reading	Error	Uncertainty ( ± )
50.0	50.08	46	-4.08	1.7

### Note:

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2$ , providing a level of confidence approximately 95%.

- End of Certificate -





**MCL**  
Microtech Calibration laboratory



NSC-TISI-TIS 17025  
CALIBRATION 0228

53/154 Moo 2, Semafahkarm Road, Tumbon Khukhot, Amphur Lamlukka, Pathumthani 12130

53/154 หมู่ 2 ถนนเสมาฟ้าคราม ตำบลลูกคต 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 : 

( Precha Pavachot )

Laboratory Manager

**Certificate of Calibration**

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

### Certificate of Calibration

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

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

**Range** : 200 g

### 3. Effect of Center Loading



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.....

### Certificate of Calibration

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

### Calibration Method

The Electronic balance was measured using standard weight following to in house calibration method MCL-CP14 and based 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



## Certificate of Calibration

**Certificate No. :** 64-400613-1

**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 : (28.0 to 29.0) °C  
Relative Humidity : (45 to 50) %  
Line Voltage : (228.0 to 230.0) V

**Date of Received :** 11 December 2021

**Date of Calibration :** 11 December 2021


**Date of Issue :** 17 December 2021

**Calibrated by :** Permpon 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 & 400032	64-400589-1	25 May 2022	National Institute of Metrology Thailand (NIMT)

Approved by :   
( Bunjerd Masri )  
Supervisor

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 Calibratech Co.,Ltd.



## Certificate of Calibration

Certificate No. : 64-400613-1

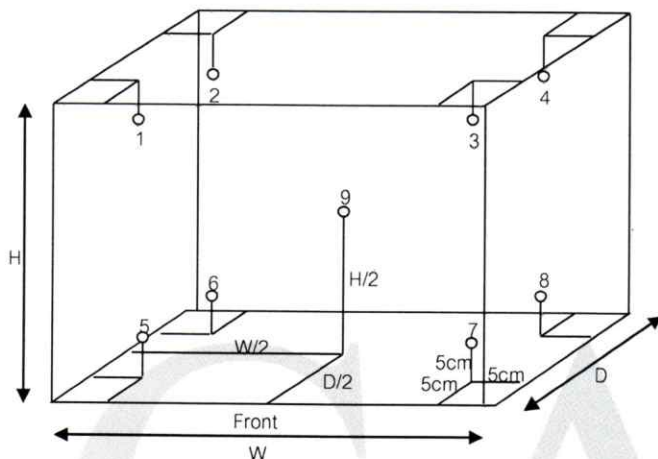
Page : 2 of 2

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<sup>3</sup>

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	103.7	104.1	104.1	104.1	104.1	103.8	103.7	103.8	104.1	0.70
180.0	180.0	180.0	179.0	179.7	179.8	180.0	180.3	179.6	179.2	179.8	180.4	0.95

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
104.0	104.0	104.0	0.7	0.1	0.7
180.0	180.0	180.0	1.7	0.2	1.7

**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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## Certificate of Calibration

**Certificate No. :** 65-420007-1

**Page :** 1 of 2

**Submitted by :** TNP Environment Co.,Ltd.

332/173 Moo 3 Bang Rak Phatthana, Bang Bua Thong, Nonthaburi 11110

**Equipment :** pH Meter (Pocket)

pH meter

Manufacturer : Adwa

Model : AD 12

Range : -2.00 to 16.00 pH

Resolution : 0.01 pH

Serial No. : 1328

ID No. : TNP-LAB-13-2564

**Environment :** Ambient Temperature :  $(25 \pm 2) ^\circ \text{C}$

Relative Humidity :  $(50 \pm 15) \%$

**Date of Received :** 01 February 2022

**Date of Calibration :** 02 February 2022

**Date of Issue :** 02 February 2022


**Calibrated by :** Bunjerd Masri

**Calibration Method :** In-house method CAL-M4201 direct measurement by using certified reference material (CRM)

**Reference Standard Instruments :** This certification is traceable to the International System of Units

Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.004	61218215	769926	15 May 2022	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.985	61223875	769927	15 May 2022	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
9.963	61208865	769928	15 May 2022	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :   
( Bunjerd Masri )

Supervisor

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 Calibratech Co.,Ltd.



## Certificate of Calibration

**Certificate No. : 65-420007-1**

**Page : 2 of 2**

**Result of Calibration :**

**UUC Condition As-Received :** Good

**Function :** pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

Adjustment Curve at nominal pH	Standard Buffer ( pH )	UUC Reading ( pH )	Correction ( pH )	Uncertainty ( $\pm$ pH )
4, 7	4.004	4.00	0.00	0.011
	6.985	7.00	-0.01	0.012
7,10	6.985	7.00	-0.01	0.012
	9.963	10.00	-0.04	0.015

Remark

1 UUC : Unit Under Calibration

2 pH meter does not have voltage mode because the plug can not BNC socket

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

This reported uncertainty of measurment 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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*B*







## Certificate of Calibration

Certificate Number : SPR21090365-2

Page : 1 of 3

Customer : TNP ENVIRONMENT CO.,LTD.

332/173 Moo.3, Bang Rak Phatthana, Bang Bua Thong, Nonthaburi  
11110

Equipment Name : pH Meter

Manufacturer : Horiba

Model : LAQUA-PH1100

Serial Number : B80A0042

ID. Number : TNP.LAB.02

### Environmental Conditions

Ambient Temperature :  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

Relative Humidity :  $50\% \pm 15\%$

Location of Calibration : In-Lab

Calibration Procedure : SP-CPC-04-01

Received Date : 23 Sep 2021

Calibration Date : 24 Sep 2021

Recommend Due Date : 24 Sep 2022

Date of Issue : 25 Sep 2021

### Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.

All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr.Kijja Visitsilp

Calibration Officer

Approved by :

( Mr.Worapong Sinthusopa )

Authorized Signatory



## Calibration Report

Certificate Number : SPR21090365-2

Page : 2 of 3

### Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Standard pH Solution	PH016.L5	Lot No.734191	61218918	07 Mar 2022
Standard pH Solution	PH107.L5	Lot No.743070	61220744	29 Apr 2022
Standard pH Solution	PH020.L5	Lot No.734193	61214484	07 Mar 2022

### Traceability

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

C.P.A. Chem - ANAB#AT-1836 (ISO/IEC 17025:2017) and ANAB#AR-1835 (ISO/IEC 17034:2016)



## Result of Calibration

Certificate No. : SPR21090365-2

Page : 3 of 3

Range : 0 to 14 pH

Resolution : 0.01 pH

pH Measurement @ 25 °C

Unit : pH

Standard Solution	UUC Reading	Error	Uncertainty ( ± )
4.008	4.01	0.002	0.012
6.984	6.99	0.006	0.012
10.011	10.02	0.009	0.013

### Note:

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

### Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2.00$ , providing a level of confidence approximately 95%.

– End of Certificate –



**Certificate No.:** T/O 640120

**Date of issue :** 5-Oct-2021

**Equipment Description** : Refrigerator  
**Equipment Model** : P1010  
**Equipment Serial No.** : P1010-1020-0005  
**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** : 5-Oct-2021  
**Receiving No.** : O-210132  
**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** : 5-Oct-2021



Mr. Kittipong Kaewsai  
**Calibration Engineer**



Ms. Nongluck Wongsettee  
**Technical Manager**

**Certificate No. : T/O 640120**

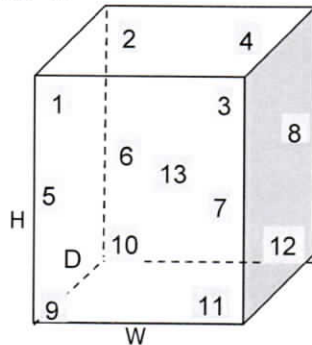
**The Reference Standard Instrument :-**

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert No.</u>
1) Data logger with RTD Probe	Agilent 34972A	MY49017365	PSL-T 0688-1/64

**Measured room conditions**

<b>Temperature :</b>	Minimum: 31.3 °C	Maximum: 33.4 °C
<b>Humidity :</b>	Minimum: 56.8 %RH	Maximum: 60.5 %RH
<b>Voltage :</b>	Minimum: 219.7 VAC	Maximum: 223.4 VAC
<b>Fresh Air Setting:</b>	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

<b>UUC* Setting</b>	<b>UUC* Reading</b>	<b>Temperature Reading of Standard Sensor</b>								
( °C )	( °C )	<b>Sensor Position</b>								
4.0	4.0	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
		4.13	4.12	3.97	4.05	4.35	4.22	4.26	4.28	3.97
		<b>Sensor Position</b>								
		<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>					
		4.23	4.28	4.38	3.96					

<b>UUC* Setting</b>	<b>UUC* Reading</b>	<b>Temperature Uniformity</b>	<b>Temperature Stability</b>	<b>Overall Variation</b>	<b>Uncertainty of Measurement</b>	<b>Coverage Factor</b>
( °C )	( °C )	( °C )	( ± °C )	( °C )	( ± °C )	<b>K</b>
4.0	4.0	0.88	0.83	1.79	1.1	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

Cert. No. : CT-22-01-22708

Page : 1 of 4

Issued date : 27 January 2022

Equipment : Water Bath , Manufacturer : MLAB , Model : WBN30  
S/N = 0347 , Customer ID = TNP LAB.10

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

Received Date : 24 January 2022

Ref. Job No. : SO6501-00045

Calibrated by : Mr.Pramot Srisukum

Cert. prepare by : Ms.Nattanicha Panumram

Calibrated Date : 24 January 2022

Approved by : Mr.Montree Ruschasetkul

Calibration Place : ห้องปฏิบัติการ2

Environment Condition : Temperature  $25.9 \pm 0.8$  (°c) , Humidity  $43.5 \pm 9.5$  (%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	10/2021
2	Thermo Hygrometer	MTEC-CE-0173	TH-03A	06/2022

**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.



Approved Signatory



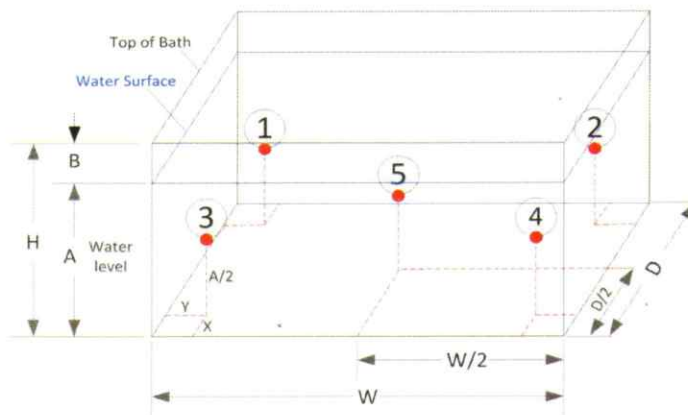
Certificate No. : CT-22-01-22708

**Calibration Result :**

Page : 2 of 4

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.



Pic 1 : Position of each sensor No.

(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 throughtout observation time.

**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	85.22	85.26	85.17	85.16	85.28	0.370	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	0.34	0.10	0.37

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

Approved Signatory : 

CERT.No.: HS-T031D

**Certificate of Calibration**

Calibration Date : 22 Apr 22

Submitted by : PINTHONG UTILITIES COMPANY LIMITED

789 Moo1 Nong koh-Laen Chabang Rd,

Nong-kham Sriracha Chonburi Thailand 20230

Avg Room Temp : 20 °C

Avg Water Temp : 20 °C

Air Pressure : 757.00 mmHg

Salinity : 0 ppt

Model : YSI 4010-2W

S/N : 22051520

Probe : YSI 4100

S/N : 22C102711

ID NO. : -

Air Temp ref : S/N. E00522

Barometric ref : S/N. E00522

Water Temp ref : S/N. 11431

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.



Technician Signature



Laboratory Manager



Certificate No. : CT-22-01-22708

Page : 3 of 4

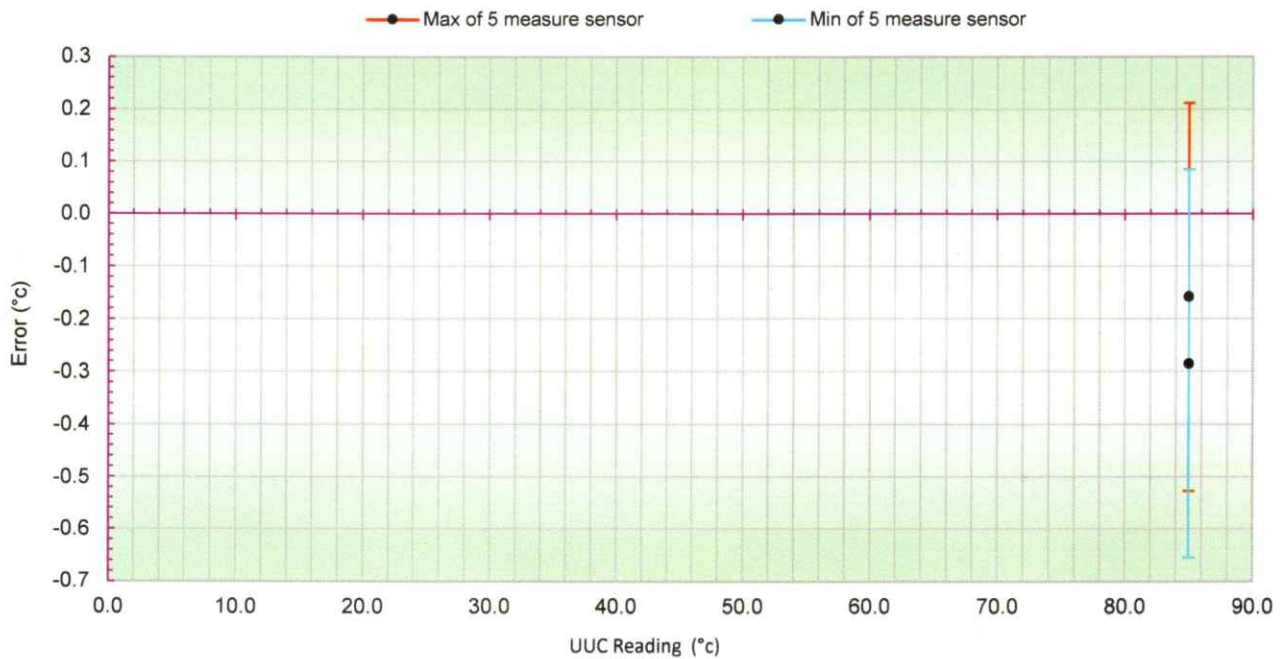
**Section 3 :** Possible of temperature in chamber. Show minimum and maximum of the average values and Include with uncertainty of measurement. , The average values is average of each position standard sensor throughout observation time.

Unit : ( °C )

Calibration Point	UUC Setting (*)	UUC Reading (*)	Possible of Minimum temperature in chamber	Possible Maximum temperature in chamber
85	85	85.0	84.79	85.65

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

**Section 4 :** Trend of accuracy



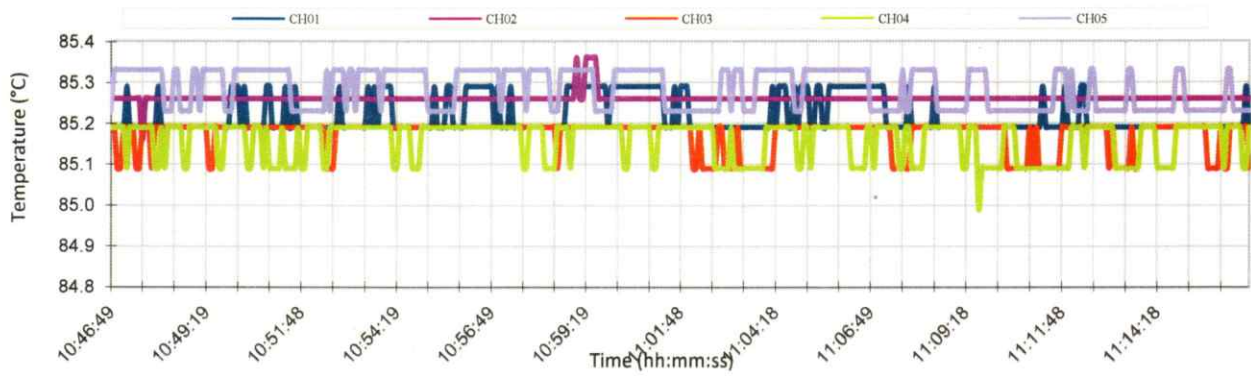
Approved Signatory : 

Certificate No. : CT-22-01-22708

Page : 4 of 4

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

(5.1) Temperature Distribution at UUC Reading 85.0 °C



Approved Signatory : .....

รายการใบรับรองสอบเทียบ/ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับตรวจวัดคุณภาพสิ่งแวดล้อม

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือหลักสำหรับตรวจสอบคุณภาพน้ำ									
1	BOD Incubator	BOD	Arco	UC4-1320 / (UAE.WAO.015/2561)	Technology Promotion Association (Thailand-Japan)	22TM90	17 Feb 22	16 Feb 23	-
2	BOD Incubator		Arco	UC4-1320 / (UAE.WAO.018/2559)	Technology Promotion Association (Thailand-Japan)	21TM1406	17 Aug 21	16 Aug 22	-
3	Analytical Balance (Readability 0.01 mg)	Total Dissolved Solids Suspended solids	Mettler-Toledo	XSR205DU / C009071872	Technology Promotion Association (Thailand-Japan)	22MM210	26 Apr 22	25 Apr 23	-
4	Hot Air Oven		Memmert	UF55 / B216.1666	Technology Promotion Association (Thailand-Japan)	21TM1876	29 Oct 21	28 Oct 22	-
5	Digestor Unit	TKN	FOSS TECATOR	2520auto / 91794469	National Food Institute, Ministry of Industry, Thailand	2202361-001-01	4 Apr 22	3 Apr 23	-
6	Distillation Unit (Kjeldahl Method)		FOSS TECATOR	KT200 / 91790524	FOSS South East Asia	5874	30 Nov 21	29 Nov 22	-
7	Analytical Balance (Readability 0.1 mg)	Fat, Oil & Grease	Mettler-Toledo	AB-204S/FACT / 1129361010	National Food Institute, Ministry of Industry, Thailand	2103270-001-01	11 Jun 21	10 Jun 22	-
8	UV-VIS Spectrophotometer	Ammonia, Cyanuric Acid Nitrate, Total Nitrogen	Hitachi	U-1900 / 2021-064	DQE Services Co.,Ltd.	SP22-007	20 Jan 22	19 Jan 23	-
9	UV-VIS Spectrophotometer		Hitachi	U-2900 / 21E22-009	DQE Services Co.,Ltd.	SP22-008	20 Jan 22	19 Jan 23	-
10	Incubator	Total Coliform Bacteria Fecal Coliform Bacteria	Memmert	IPP 260 / V616.0066	Technology Promotion Association (Thailand-Japan)	21TM1874	28 Oct 21	27 Oct 22	-
11	Incubator		Memmert	IPP 260 / V615.0187	Technology Promotion Association (Thailand-Japan)	22TM563	07 Apr 22	06 Apr 23	-
12	Incubator	Pseudomonas aeruginosa Clodtridium perfringens	Memmert	IN 75 / D317.0307	Technology Promotion Association (Thailand-Japan)	22TM335	17 Feb 22	16 Feb 23	-

รายการใบรับรองสอบเทียบ/ทวนสอบ เครื่องมือหลักประจำห้องปฏิบัติการวิเคราะห์ สำหรับตรวจวัดคุณภาพสิ่งแวดล้อม

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
เครื่องมือหลักสำหรับตรวจสอบคุณภาพน้ำ									
13	Incubator	Total Coliform Bacteria Fecal Coliform Bacteria	Memmert	BE400 / e402.1032	Technology Promotion Association (Thailand-Japan)	21TM1358	15 Jul 21	14 Jul 22	-
14	Water Bath	Escherichia coli Staphylococcus aureus	Memmert	WNE 14 / L416.0612	Technology Promotion Association (Thailand-Japan)	22TM334	17 Feb 22	16 Feb 23	-
15	Water Bath	Pseudomonas aeruginosa Clodtridium perfringens	Memmert	WNE 14 / L414.1407	Technology Promotion Association (Thailand-Japan)	22TM565	7 Apr 22	6 Apr 23	-
16	Analytical Balance		Mettler-Toledo	MS603S / B0070110311	Mettler-Toledo (Thailand) Ltd.	TH2058-096-040722-ACC-TH	7 Apr 22	6 Apr 23	-
17	Auto Clave		ALP	CL-40L / 802664	Technology Promotion Association (Thailand-Japan)	22TM89	17 Feb 22	16 Feb 23	-

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





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



Cert. No.: 22TM90

Page.: 1 of 3

## Certificate of Calibration

**Equipment :** BOD Incubator

**Manufacturer :** Arco

**Model :** UC4-1320

**Serial No. :** 13URC4S013201

**ID No. :** UAE.WAO.015/2561

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

**Location :** Lab Floor 2

**Received Order :** 17 February 2022

**Calibration Date :** 17 February 2022

**Ambient Temperature :** ( 26 ± 10 ) °C

**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Kunchit Promprat

**Approved by :**

*Malee*

Approved Signatory

( ☒ ) Pornthippa Tameyakul

( ☒ ) Malee Butkruea

( ☐ ) Suwit Imjai

**Issue Date :** 22 February 2022

The Uncertainties are for a confidence probability of approximately 95%

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

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A 0038099



**Equipment :** BOD Incubator  
**Condition As-Received :** Used Item  
**Reference :** 2202-0446OC-1  
**Procedure Used :-**

**Cert. No.:** 22TM90

**Page.:** 2 of 3

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:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1 ) Data Acquisition	34970A	MY44035217	21LM30	23 Dec 2022

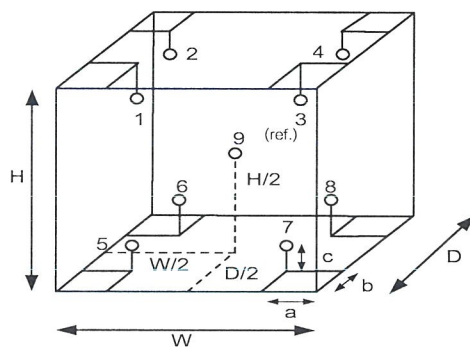
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Not Available



Environment during calibration		
	Beginning	Finished
Temp. ( °C )	28	28
REL.Humid. ( % )	68	75
AC Supply ( Volt )	226	226

**Probe Installation Details :**

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

**Dimension of Chamber :**

D = 0.62 m  
W = 1.2 m  
H = 1.2 m  
Capacity = 0.89 m<sup>3</sup>

Position :	Ref. Std. ID No.:
1	18-10RTD-01
2	18-10RTD-02
3	18-10RTD-03
4	18-10RTD-04
5	18-10RTD-05
6	22-10RTD-10
7	18-10RTD-07
8	18-10RTD-08
9 (ref.)	18-10RTD-09

*Mlu.*

เอกสารไม่ควบคุม  
a 1096042



Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2202-0446OC-1  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Not Available

Cert. No.: 22TM90

Page.: 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
20.0	19.5	19.4	0.30	0.58	1.0	0.55	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.154	20.013	20.356	19.939	19.834	19.761	19.817	19.824	19.922

**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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Wala .

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a 1096041





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Cert. No.: 21TM1406

Page.: 1 of 3

## Certificate of Calibration

**Equipment :** BOD Incubator

**Manufacturer :** Arco

**Model :** UC4-1320

**Serial No. :** -

**ID No. :** UAE.WAO.018/2559

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

**Location :** Lab Floor 2

**Received Order :** 17 August 2021

**Calibration Date :** 17 August 2021

**Ambient Temperature :** ( 26 ± 10 ) °C

**Relative Humidity :** ( 50 ± 30 ) %

**Calibrated by :** Khit Ruttanaprapachai

**Approved by :**

  
Approved Signatory

- ( ) Pornthippa Tameyakul  
( ☒ ) Malee Butkruea  
( ) Suwit Imjai

**Issue Date :** 1 September 2021

The Uncertainties are for a confidence probability of approximately 95%

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A 0031568





Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2108-0364OC-2

Cert. No.: 21TM1406

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	MY41021843	21LM2	18 Feb 2022

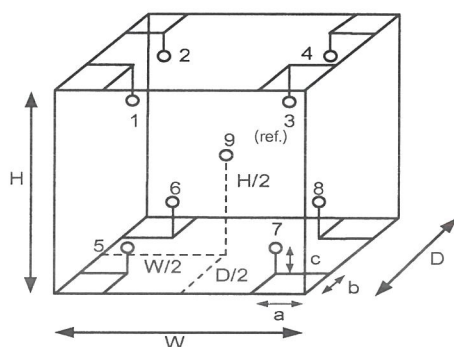
2. This certificate is valid only to the item calibrated on date and place of calibration.

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

**Result of Calibration :-** ( \* ) Without Adjustment

**Function of UUC\* :** Temperature Source

**Fresh air setting :** Not Available



Environment during calibration		
	Beginning	Finished
Temp. ( °C )	28	29
REL.Humid. ( % )	52	55
AC Supply ( Volt )	220	221

Position :	Ref. Std. ID No.:
1	21-04RTD-11
2	21-04RTD-12
3	21-04RTD-13
4	21-04RTD-14
5	21-04RTD-15
6	21-04RTD-16
7	21-04RTD-17
8	21-04RTD-18
9 (ref.)	21-04RTD-19

**Probe Installation Details :**

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

**Dimension of Chamber :**

D = 0.53 m  
W = 1.2 m  
H = 1.2 m  
Capacity = 0.76 m<sup>3</sup>

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เอกสารไม่ควบคุม  
a 1069644



Equipment : BOD Incubator  
Condition As-Received : Used Item  
Reference : 2108-0364OC-2  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Not Available

Cert. No.: 21TM1406

Page.: 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
20.0	19.8	19.7	0.37	0.50	1.1	0.62	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
20.0	20.040	19.742	20.203	19.762	19.784	19.819	19.764	19.797	19.787

**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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Malu .

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a 1069643



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Cert.No.: 22MM210  
Page.: 1 of 3

## Certificate of Calibration

**Equipment :** Electronic Balance

**Manufacturer :** Mettler Toledo

**Model :** XSR205

**Serial No. :** C009071872


**ID No. :** UAE.WAO.012/2563

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

**Location :** Balance Room

**Received order :** 26 April 2022  
**Calibration Date :** 26 April 2022  
**Ambient Temperature :** 15 °C to 40 °C  
**Relative Humidity :** 30 % to 90 %

**Calibrated by :** Kunchit Promprat

**Approved by :**   
Approved Signatory

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

**Issue Date :** 29 April 2022

The Uncertainties are for a confidence probability of approximately 95%

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

เอกสารไม่ควบคุม  
0049716





Equipment : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2204-0542OC-1

Cert.No.: 22MM210  
Page: 2 of 3

**Procedure used :-**

Calibration were conducted using in-house calibration procedure CP-OB01 according to direct measurement method against standard weight.

**Condition of this result of calibration**

**1. Reference standard instruments:-**

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Test report No.</u>	<u>Due date</u>
1) Standard Weight Set (E2)	15884	-	70RC138	MM-0009-21	3 Feb 2023

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This result of calibration was made on requested at the point specified by customer.
4. This certificate is not certified for any commercial transaction.
5. This certification is traceable to the International System of Unit.

**Result of calibration** ( ) Without Adjustment ( \* ) After Adjustment by Internal Calibration

<b>Range capacity :</b>	0 g to 81 g	<b>Resolution</b>	0.00001 g
	81 g to 220 g	<b>Resolution</b>	0.0001 g

**Before Adjustment :**

<u>Applied Weight</u>	<u>Balance Reading</u>	<u>Correction</u>	<u>Measurement Uncertainty</u>	<u>Coverage Factor</u>
( g )	( g )	( g )	( $\pm$ mg )	( k )
80	80.00004	-0.00004	0.15	2.00
200	199.9999	+0.0001	0.35	2.00

**After Adjustment :**

**1. Determination of the standard deviation of weighing machine** ( n = 10 )

<u>Applied Weight</u>	<u>Standard Deviation of Reading ( g )</u>
( g )	
80	0.000008
200	0.00005

Malu .



Equipment : Electronic Balance  
Condition As-Received : Used Item  
Reference : 2204-0542OC-1

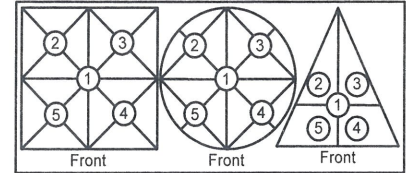
Cert.No.: 22MM210

Page: 3 of 3

## Result of calibration

### 2. Effect of off center loading

A mass of 100 g was placed to various position on the pan.  
The weighing machine reading error obtained is given in the table



Maximum difference between  
off-center and central loading  
( g )  
0.0002

Position 1 ( g )	Position 2 ( g )	Position 3 ( g )	Position 4 ( g )	Position 5 ( g )
-0.0002	-0.0001	0.0000	-0.0002	-0.0002

### 3. Departure from nominal value

Applied Weight ( g )	Balance Reading ( g )	Correction ( g )	Measurement Uncertainty ( ± mg )	Coverage Factor ( k )
Unload	0.00000	0.00000	0.016	2.13
0.05	0.05001	-0.00001	0.016	2.13
0.1	0.10001	-0.00001	0.017	2.11
1	1.00002	-0.00002	0.019	2.05
5	5.00003	-0.00003	0.026	2.00
20	20.00008	-0.00008	0.049	2.00
50	50.00010	-0.00010	0.080	2.00
80	80.00014	-0.00014	0.15	2.00
100	100.0001	-0.0001	0.21	2.00
150	150.0001	-0.0001	0.29	2.00
200	200.0001	-0.0001	0.35	2.00

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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Maku.



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Cert. No.: 21TM1876

Page.: 1 of 3

## Certificate of Calibration

**Equipment :** Hot Air Oven

**Manufacturer :** Memmert

**Model :** UF 55

**Serial No. :** B216.1666

**ID No. :** UAE.WAO.027/2559

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

**Location :** Lab Floor 2

**Received Order :** 29 October 2021

**Calibration Date :** 29 October 2021

**Ambient Temperature :** (  $26 \pm 10$  ) °C

**Relative Humidity :** (  $50 \pm 30$  ) %

**Calibrated by :** Kunchit Promprat

**Approved by :**

Approved Signatory

- ( ☒ ) Pornthippa Tameyakul  
( ☒ ) Malee Butkruea  
( ☐ ) Suwit Imjai

**Issue Date :** 4 November 2021

**The Uncertainties are for a confidence probability of approximately 95%**

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**Equipment :** Hot Air Oven  
**Condition As-Received :** Used Item  
**Reference :** 2110-0701OC-1

**Cert. No.:** 21TM1876

**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 ) and Thermocouple Type T.

The temperature scale used was based on ITS-90.

**Condition of this result of calibration**

1. Reference standard instrument:-

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

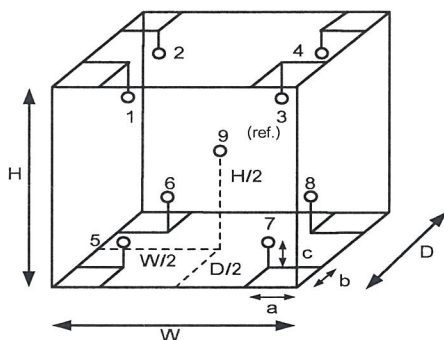
2. This certificate is valid only to the item calibrated on date and place of calibration.

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 )	28	28
REL.Humid. ( % )	56	55
AC Supply ( Volt )	230	230

Ref. Std. ID No.: @ Calibration Point		
Position :	( 140, 180 ) °C	( 104 ) °C
1	21-15TC-01	15RTD2/11
2	21-15TC-02	15RTD2/12
3	21-15TC-03	15RTD2/13
4	21-15TC-04	15RTD2/14
5	21-15TC-05	15RTD2/15
6	21-15TC-06	15RTD2/20
7	21-15TC-07	15RTD2/17
8	21-15TC-08	15RTD2/18
9 (ref.)	21-15TC-09	15RTD2/19

**Probe Installation Details :**

a =	5.0	cm	D =	0.33	m
b =	5.0	cm	W =	0.40	m
c =	5.0	cm	H =	0.40	m
Capacity =			0.053	m <sup>3</sup>	

Malu.

เอกสารไม่ควบคุม



Equipment : Hot Air Oven  
Condition As-Received : Used Item  
Reference : 2110-0701OC-1  
Result of Calibration :- ( \* ) Without Adjustment  
Function of UUC\* : Temperature Source  
Fresh air setting : Close

Cert. No.: 21TM1876  
Page.: 3 of 3

Calibration Point ( °C )	UUC* Setting ( °C )	UUC* Reading ( °C )	Temperature stability ( ± °C )	Temperature uniformity ( °C )	Overall Variation ( °C )	Uncertainty ( ± °C )	Coverage Factor <i>k</i>
104.0	104.0	104.0	0.11	0.52	0.72	0.42	2
140.0	140.0	140.0	0.25	1.1	1.4	1.1	2
180.0	180.0	180.0	0.18	0.87	1.2	1.1	2

Calibration Point ( °C )	Measured Temperature ( °C )								
	Position								
	1	2	3	4	5	6	7	8	9 (ref.)
104.0	103.852	103.978	104.382	104.323	103.776	104.015	104.312	104.196	103.907
140.0	140.309	140.730	140.426	140.270	139.531	139.666	140.067	139.895	139.750
180.0	180.598	180.339	180.755	180.619	179.716	179.829	180.204	180.365	179.975

**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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Malu

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