

บริษัท น้ำตาลวังขนาย จำกัด
รายงานผลการปฏิบัติตามมาตรการป้องกันและแก้ไขผลกระทบสิ่งแวดล้อมและ
มาตรการติดตามตรวจสอบคุณภาพสิ่งแวดล้อม
โครงการโรงงานน้ำตาลวังขนาย บริษัท น้ำตาลวังขนาย จำกัด (ระยะดำเนินการ)

ภาคผนวกที่ 4

ใบรับรองการสอบเทียบเครื่องมือ

จัดทำโดย



PINTHONG GROUP

บริษัท ปิ่นทองกรุ๊ป แมนเนจเม้นท์ แอนด์ คอนซัลแตนท์ จำกัด
เลขที่ 27 ถนนพระราม 2 แขวงท่าข้าม
เขตบางขุนเทียน กรุงเทพมหานคร 10150

Certificate of Calibration

Certificate No. : 64-410086-1

Page : 1 of 2

Submitted by : Pinthong Group Management and Consultants Co., Ltd.
81/109 Pinthong Group Building, Moo 1, Rama 2 Road,
Tha Kham, Bang Khun Thian, Bangkok 10150

Equipment : Digital Thermo-Hygrometer

Manufacturer : Digicon Model : TH-02A
Range Temperature : -10 °C to 50 °C Resolution : 0.1 °C
Range Humidity : 20 %R.H. to 95 %R.H. Resolution : 1 %R.H.
Serial No. : 395006833 ID No. : N/A

Environment : Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 15) %

Date of Received : 10 August 2021

Date of Calibration : 16 August 2021

Date of Issue : 16 August 2021

Calibrated by : Chortip Samchusri

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4013 by compared with standard probe sensor humidity/temperature into humidity/temperature chamber.

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

Digital Indicator with Standard Probe Temp&Hum

ID No.	Cert. No.	Due Date	Traceability
400034 & 400035	SG-H-00664/64	07 Jan 2022	Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-410086-1

Page : 2 of 2

UUC Condition As-Received : Good

Result of Calibration : Without Adjustment

Function : Temperature measurement

Reference Humidity @ 50 %R.H.

Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
24.99	24.7	0.3	0.46

Result of Calibration : Without Adjustment

Function : Humidity measurement

Reference Temperature @ 25 °C

Standard Humidity (%R.H.)	UUC Reading (%R.H.)	Correction (%R.H.)	Uncertainty (± %R.H.)
50.02	46	4	2.2

Remark

UUC : Unit Under Calibration

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. : 64-420092-1

Page : 1 of 2

Submitted by : Pinthong Group Management and Consultants Co.,Ltd.
81/109 Pinthong Group Building, Moo 1, Rama 2 Road,
Tha Kham, Bang Khun Thian, Bangkok 10150

Equipment : pH Meter with electrode
pH meter
Manufacturer : Eutech Model : pH 700
Range : N/A pH Resolution : 0.01 pH
Serial No. : 2055173 ID No. : N/A
Electrode
Model : N/A Serial No. : 01X099320 173

Environment : On site calibration was carried out at the Laboratory,
Pinthong Group Management and Consultants Co.,Ltd.

Ambient Temperature : (22.0 to 23.5)° C

Relative Humidity : (54 to 58) %

Date of Received : 10 August 2021

Date of Calibration : 10 August 2021

Date of Issue : 13 August 2021

Calibrated by : Bunjerd Masri

Calibration Method : In-house method CAL-M4201 direct measurement by using standard voltage calibrator and using certified reference material (CRM)

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

1. Multiproduct Calibrator

ID No.	Cert. No.	Due Date	Traceability
400005	E1U190739	31 Aug 2021	National Institute of Metrology Thailand (NIMT)

2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.004	61218215	753167	02 Feb 2022	CPA chem
6.987	61211742	758970	02 Feb 2022	CPA chem
9.961	61223868	753169	02 Feb 2022	CPA chem

Approved by :

(Bunjerd Masri)

Supervisor



Certificate of Calibration

Certificate No. : 64-420092-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement

pH meter

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

Adjustment Curve at nominal pH	Applied Voltage (mV)	Nominal Value (pH)	UUC Reading		Correction (mV)	Uncertainty (± mV)
			(pH)	(mV)		
4, 7, 10	177.4800	4	4.00	177.8	-0.3	0.12
	0.0000	7	7.00	0.3	-0.3	0.086
	-177.4800	10	10.00	-177.0	-0.5	0.12

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 (± pH)
4, 7, 10	4.004	4.00	0.00	0.011
	6.987	7.00	-0.01	0.020
	9.961	10.00	-0.04	0.053

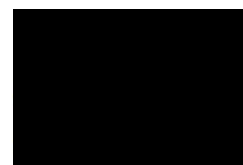
Remark

UUC : Unit Under Calibration

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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Certificate of Calibration

Certificate No. : 64-400401-2

Page : 1 of 2

Submitted by : Pinthong Group Management and Consultants Co., Ltd.
81/109 Pinthong Group Building, Moo 1, Rama 2 Road,
Thakham, Bangkhunthian, Bangkok 10150

Equipment : Air Chamber (Oven)
Manufacturer : Memmert Model : UNB 100
Range : N/A °C Resolution : 0.5 °C
Serial No. : C112.0664 ID No. : N/A

Environment : On site calibration was carried out at the Laboratory
Pinthong Group Management and Consultants Co., Ltd.
Ambient Temperature : (30.0 to 32.0) °C
Relative Humidity : (50 to 55) %
Line Voltage : (231.0 to 231.5) V

Date of Received : 10 August 2021

Date of Calibration : 10 August 2021

Date of Issue : 14 August 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	64-400106-1	30 Sep 2021	National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-400401-2

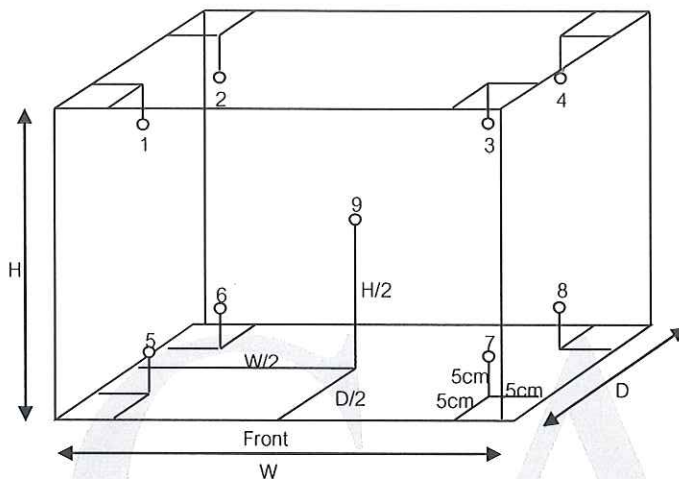
Page : 2 of 2

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 = 0.32 m

D = 0.17 m

H = 0.24 m

Capacity = 0.01 m³

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	107.5	107.5	104.4	104.6	104.1	104.1	103.1	103.5	103.2	103.4	103.8	0.83

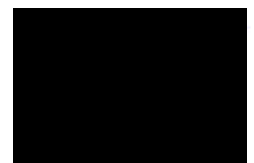
Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
104.0	107.5	107.5	1.0	0.3	1.7

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. : 64-400401-1

Page : 1 of 2

Submitted by : Pinthong Group Management and Consultants Co., Ltd.
81/109 Pinthong Group Building, Moo 1, Rama 2 Road,
Thakham, Bangkhunthian, Bangkok 10150

Equipment : Air Chamber (Oven)
Manufacturer : Memmert Model : UN30
Range : N/A °C Resolution : 0.1 °C
Serial No. : B115.2008 ID No. : N/A

Environment : On site calibration was carried out at the Laboratory
Pinthong Group Management and Consultants Co., Ltd.

Ambient Temperature : (30.0 to 32.0) °C
Relative Humidity : (50 to 55) %
Line Voltage : (231.0 to 231.5) V

Date of Received : 10 August 2021

Date of Calibration : 10 August 2021

Date of Issue : 14 August 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 & 400030	64-400104-1	29 Sep 2021	National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor



Certificate of Calibration

Certificate No. : 64-400401-1

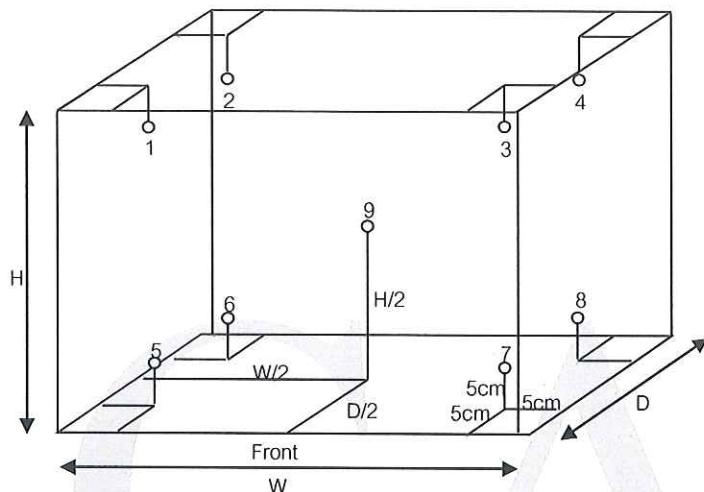
Page : 2 of 2

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 = 0.25 m

H = 0.32 m

Capacity = 0.03 m³

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	
180.0	182.0	182.0	180.8	181.0	179.8	180.7	179.2	179.6	179.0	179.4	179.7	0.95

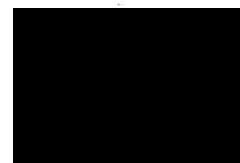
Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
180.0	182.0	182.0	1.4	0.3	2.3

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. : 64-200231-1

Page : 1 of 2

Submitted by : Pinthong Group Management and Consultants Co., Ltd.
81/109 Pinthong Group Building, Moo 1, Rama 2 Road, Tha Kham, Bang Khun Thian,
Bangkok 10150

Equipment : Electronic Balance
Manufacturer : Sartorius Model : CPA225D
Serial No. : 23208183
Capacity : 220 g Resolution : 0.00001g/100g, 0.0001g/220g

Environment : On site calibration was carried out at the Laboratory,
Pinthong Group Management and Consultants Co., Ltd.

Ambient Temperature : (26.8 to 26.9) °C
Relative Humidity : (44.8 to 46.7) %
Air Pressure : 1006.0 mbar

Date of Received : 10 August 2021

Date of Calibration : 10 August 2021

Date of Issue : 13 August 2021

Calibrated by : Akaradath Thippichai

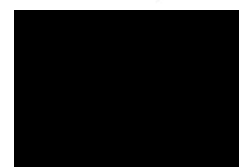
Calibration Method : In-house method CAL-M2001 based on UKAS Publication ref : LAB 14
Edition 5, July 2015

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

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E261-E2624	C02204101	17 Nov 2021	National Institute of Metrology (Thailand), (NIMT)

Approved by :



(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-200231-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty \pm (g)
0.05	0.00000	0.000017
0.1	0.00001	0.000021
0.5	-0.00001	0.000025
1	0.00000	0.000029
5	0.00001	0.000043
10	0.00003	0.000053
20	0.00003	0.000071
50	0.00013	0.00011
100	0.00014	0.00020
200	0.0003	0.00038

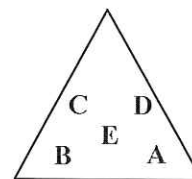
This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.23$, providing a level of confidence of approximately 95%

Eccentric error

Load test : 50 g

A B C D E
-0.00003 0.00001 0.00003 -0.00001 0.00000 g

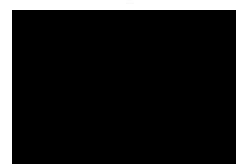


Repeatability

Load test : 200 g

Stdev. : 0.000000 g

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Certificate of Calibration

Certificate No. : 64-210380-1

Page : 1 of 2

Submitted by : Pinthong Group Management And Consultants Co., Ltd.
81/109 Pinthong Group Building, Moo 1, Rama 2 Road, Tha Kham,
Bang Khun Thian, Bangkok 10150

Equipment : Weight
Manufacturer : N/A Material : Stainless Steel
Weight size : 1 g
ID No. : S1G1585-13

Assumed density of weight : 7950 kg / m³
Assumed Air density : 1.2 kg / m³
Environment : Ambient Temperature : (20 ± 2) °C
Relative Humidity : (50 ± 10) %
Air Pressure : 1011.5 mbar

Date of Received : 10 August 2021

Date of Calibration : 16 August 2021

Date of Issue : 16 August 2021

Calibrated by : Wuttichai Swatphong

Calibration Method : In-house method CAL-M2101 based on OIML R 111-1 : 2004(E)

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

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E2413-E2425	MM-0060-19	27 Mar 2022	National Institute of Metrology (Thailand), (NIMT)

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-210380-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

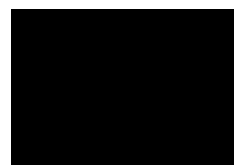
No.	Nominal Value	Id.Mark	Conventional mass Value		Measuring Uncertainty
1	1 g	none	1 g	+0.023 mg	\pm 0.023 mg

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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CAL



Certificate of Calibration

Certificate No. : 64-210380-2

Page : 1 of 2

Submitted by : Pinthong Group Management And Consultants Co., Ltd.
81/109 Pinthong Group Building, Moo 1, Rama 2 Road, Tha Kham,
Bang Khun Thian, Bangkok 10150

Equipment : Weight
Manufacturer : N/A Material : Stainless Steel
Weight size : 100 g
ID No. : S100G2782-13

Assumed density of weight : 7950 kg / m³

Assumed Air density : 1.2 kg / m³

Environment : Ambient Temperature : (20 ± 2) °C

Relative Humidity : (50 ± 10) %

Air Pressure : 1011.7 mbar

Date of Received : 10 August 2021

Date of Calibration : 16 August 2021

Date of Issue : 16 August 2021

Calibrated by : Wuttichai Swatphong

Calibration Method : In-house method CAL-M2101 based on OIML R 111-1 : 2004(E)

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

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E2413-E2425	MM-0060-19	27 Mar 2022	National Institute of Metrology (Thailand), (NIMT)

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-210380-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

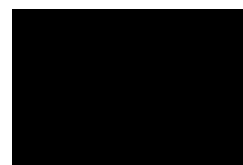
No.	Nominal Value	Id.Mark	Conventional mass Value		Measuring Uncertainty
1	100 g	none	100 g	-0.13 mg	\pm 0.11 mg

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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CAL



Certificate of Calibration

Certificate No. : 64-210380-3

Page : 1 of 2

Submitted by : Pinthong Group Management And Consultants Co., Ltd.
81/109 Pinthong Group Building, Moo 1, Rama 2 Road, Tha Kham,
Bang Khun Thian, Bangkok 10150

Equipment : Weight
Manufacturer : N/A Material : Stainless Steel
Weight size : 200 g
ID No. : 63-210392-3

Assumed density of weight : 7950 kg / m³

Assumed Air density : 1.2 kg / m³

Environment : Ambient Temperature : (20 ± 2) °C

Relative Humidity : (50 ± 10) %

Air Pressure : 1011.7 mbar

Date of Received : 10 August 2021

Date of Calibration : 16 August 2021

Date of Issue : 16 August 2021

Calibrated by : Wuttichai Swatphong

Calibration Method : In-house method CAL-M2101 based on OIML R 111-1 : 2004(E)

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

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E2413-E2425	MM-0060-19	27 Mar 2022	National Institute of Metrology (Thailand), (NIMT)

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-210380-3

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

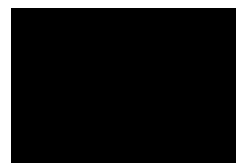
No.	Nominal Value	Id.Mark	Conventional mass Value		Measuring Uncertainty
1	200 g	none	200 g	-0.22 mg	\pm 0.17 mg

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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CAL



Certificate of Calibration

Certificate No. : 64-400234-1

Page : 1 of 2

Submitted by : Special Lab Envi and Consultant Co., Ltd.
47/91 Moo 3, Tambol Tha-it, Pakkret, Nonthaburi 11120

Equipment : Digital Thermometer with TC probe
Temperature Indicator
Manufacturer : Thermo Scientific Model : TEMP 10K
Range : -250 °C to 1372 °C Resolution : 0.1 °C
Serial No. : 4008958 ID No. : LB-Eq-013

Environment : Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 15) %
Line Voltage : (220 ± 22) VAC

Date of Received : 30 April 2021

Date of Calibration : 05 May 2021

Date of Issue : 05 May 2021

Calibrated by : Chortip Samchusri

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4003 by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

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

1. Platinum Resistance Thermometer (PRT)

ID No.	Cert. No.	Due Date	Traceability
400001	TT-0016-20	04 Mar 2022	National Institute of Metrology Thailand (NIMT)
400002	TT-0050-20	18 Jun 2022	National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400003	19E134	06 Jun 2021	National Institute of Metrology Thailand (NIMT)
400004	19E134	06 Jun 2021	National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor



Certificate of Calibration

Certificate No. : 64-400234-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement with Thermocouple probe Type K

Model : Type K Sheath Material : Teflon
Diameter : 2 mm. Length : 1500 mm.
Serial No. : N/A ID No. : SL-39

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
130	4.0027	4.2	-0.2	0.18
130	104.0024	104.3	-0.3	0.45
130	150.0031	150.2	-0.2	0.58
130	180.0024	180.0	0.0	0.65

Model : AD-1218-230 Sheath Material : Stainless
Diameter : 3.5 mm. Length : 230 mm.
Serial No. : N/A ID No. : SL-40

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
124	250.0017	249.3	0.7	1.2
124	350.0042	347.8	2.2	1.5

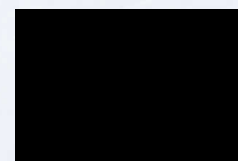
Remark

UUC : Unit Under Calibration

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. : 65-400224-1

Page : 1 of 2

Submitted by : Special Lab Envi and Consultant Co., Ltd.
47/91 Moo 3, Tambol Tha-it, Pakkret, Nonthaburi 11120

Equipment : Digital Thermometer with TC probe
Temperature Indicator
Manufacturer : Thermo Scientific Model : TEMP 10K
Range : -250 °C to 1372 °C Resolution : 0.1 °C
Serial No. : 4008958 ID No. : LB-Eq-013

Environment : Ambient Temperature : (23 ± 2) °C
Relative Humidity : (50 ± 15) %
Line Voltage : (220 ± 22) VAC

Date of Received : 27 April 2022

Date of Calibration : 03 May 2022

Date of Issue : 03 May 2022

Calibrated by : Chortip Samchusri

Calibration Method : This instrument was calibrated by In-house method comparison technique.CAL-M4003
by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

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

1. Platinum Resistance Thermometer (PRT)

ID No.	Cert. No.	Due Date	Traceability
400001	TT-0016-22	07 Feb 2024	National Institute of Metrology Thailand (NIMT)
400016	TT-0059-21	02 Jun 2023	National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400003	21E1850	14 Jun 2023	National Institute of Metrology Thailand (NIMT)
400004	21E1850	14 Jun 2023	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. : 65-400224-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement with Thermocouple probe Type K

Model : Type K Sheath Material : Teflon
Diameter : 2 mm. Length : 1500 mm.
Serial No. : N/A ID No. : SL-39

Immersion Depth (mm.)	Standard Reading (° C)	UUC Reading (° C)	Correction (° C)	Uncertainty (± ° C)
130	3.0013	3.6	-0.6	0.18
130	20.0007	20.4	-0.4	0.18
130	104.0011	103.9	0.1	0.45
130	150.0025	150.2	-0.2	0.58
130	180.0025	179.8	0.2	0.65

Model : AD-1218-230 Sheath Material : Stainless
Diameter : 3.5 mm. Length : 230 mm.
Serial No. : N/A ID No. : SL-40

Immersion Depth (mm.)	Standard Reading (° C)	UUC Reading (° C)	Correction (° C)	Uncertainty (± ° C)
124	380.0036	379.1	0.9	1.5
124	399.9910	399.0	1.0	1.6

Remark

UUC : Unit Under Calibration

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 FAX. 0-2719-9484

Cert.No.: 21TW44

Page.: 1 of 2

Certificate of Testing

Equipment :	DO Meter
Manufacturer :	Hanna
Model :	HI98193
Serial No. :	03030056991
ID No. :	LB-Eq-014
Received Date :	05 March 2021
Test Date :	05 March 2021
Reference :	2103-0294WN-1
Submitted by :	Special Lab Envi And Consultant Co.,Ltd 47/91 Moo 3 Thambon Tha-it, Pakkret, Nonthaburi 11120
Laboratory Condition :	Temperature (25 ± 5) °C Humidity (50 ± 20) %
Test Procedure :	In - house method : CP-CH9 by Comparison Technique with Azide Modification Method
Calibrated by :	Walalak Sirithean
Approved by :	<div style="background-color: black; width: 150px; height: 20px; margin: 0 auto;"></div> Approved Signatory
<input checked="" type="checkbox"/> Malee Butkruea <input type="checkbox"/> Saithip Meangmai <input type="checkbox"/> Warakorn Lerngagtrakul	
Issue Date :	8 March 2021



Cert.No.: 21TW44

Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: KC1N20CDJ

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.02	8.05	0.0084

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory

-o0o-

Certificate of Calibration

Certificate No. : 64-400224-2

Page : 1 of 2

Submitted by : Special Lab Envi and Consultant Co., Ltd.
47/91 Moo 3 Thambol Tha-it, Pakkret, Nonthaburi 11120

Equipment : Air Chamber (Incubator)

Manufacturer : Lovibond

Model : FKU 1800

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 0914643-01

ID No. : N/A

Environment : On site calibration was carried out at the Laboratory,
Special Lab Envi and Consultant Co., Ltd.

Ambient Temperature : (26.0 to 26.5) °C

Relative Humidity : (50 to 60) %

Line Voltage : (226.0 to 226.5) V

Date of Received : 30 April 2021

Date of Calibration : 30 April 2021

Date of Issue : 03 May 2021

Calibrated by : Permpoon 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	64-400106-1	30 Sep 2021	National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 64-400224-2

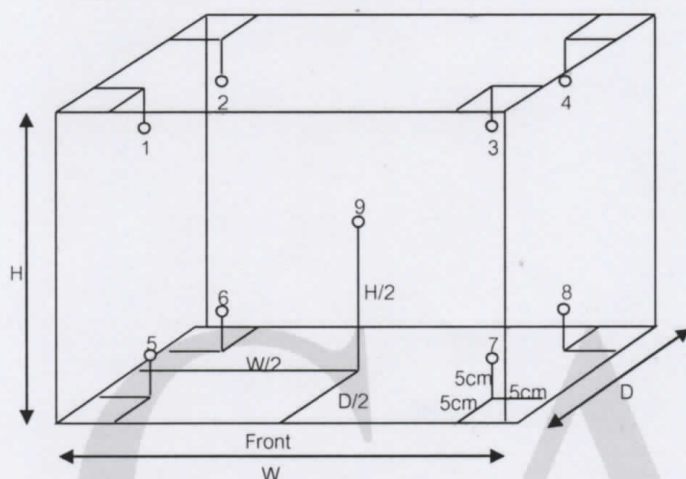
Page : 2 of 2

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 = 0.55 m

D = 0.73 m

H = 0.50 m

Capacity = 0.20 m³

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	
20.0	19.3	19.3	20.2	20.1	20.1	20.1	20.1	20.1	20.0	20.0	20.0	0.69

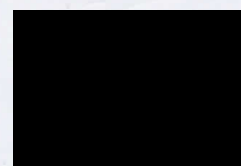
Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
20.0	19.3	19.3	0.4	0.4	0.8

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%

- o0o -



Certificate of Calibration

Certificate No. : 65-400213-2

Page : 1 of 2

Submitted by : Special Lab Envi and Consultant Co., Ltd.
47/91 Moo 3 Thambol Tha-it, Pakkret, Nonthaburi 11120

Equipment : Air Chamber (Incubator)
Manufacturer : Lovibond Model : FKU 1800
Range : N/A °C Resolution : 0.1 °C
Serial No. : 0914643-01 ID No. : LB-Eq-004

Environment : On site calibration was carried out at the Laboratory,
Special Lab Envi and Consultant Co., Ltd.

Ambient Temperature : (28.0 to 29.0) °C

Relative Humidity : (45 to 50) %

Line Voltage : (226.0 to 226.5) V

Date of Received : 27 April 2022

Date of Calibration : 27 April 2022

Date of Issue : 30 April 2022

Calibrated by : Permpoon 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%

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Certificate of Calibration

Certificate No. :65-400213-2

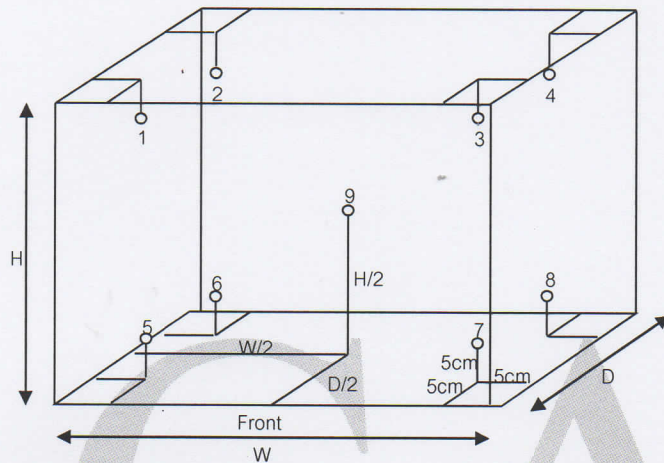
Page : 2 of 2

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 = 0.55 m

D = 0.73 m

H = 0.50 m

Capacity = 0.20 m³

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	
20.0	19.3	19.3	20.2	20.1	20.1	20.0	20.0	20.0	20.1	20.0	20.0	0.65

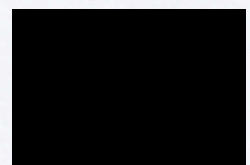
Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
20.0	19.3	19.3	0.3	0.3	0.7

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%

- o0o -



Certificate of Calibration

Certificate No. : 64-400532-1

Page : 1 of 2

Submitted by : Special Lab Envi and Consultant Co., Ltd.
47/91 Moo 3 Thambol Tha-it, Pakkret, Nonthaburi 11120

Equipment : Water Bath
Manufacturer : Memmert Model : WNB22
Range : N/A °C Resolution : 0.1 °C
Serial No. : L520.0201 ID No. : LB-Eq-041

Environment : On site calibration was carried out at the Laboratory, Special Lab Envi and Consultant Co., Ltd.
Ambient Temperature : (29.0 to 31.0) °C
Relative Humidity : (55 to 60) %
Line Voltage : (226.0 to 226.5) V

Date of Received : 20 October 2021

Date of Calibration : 20 October 2021

Date of Issue : 20 October 2021

Calibrated by : Permpon Chanpu

Calibration Method : This instrument was calibrated by In-house method CAL-M4006 based on ASTM E715-80
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 RTD probe

ID No.	Cert. No.	Due Date	Traceability
400029 & 400031	64-400433-1	07 Apr 2022	National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

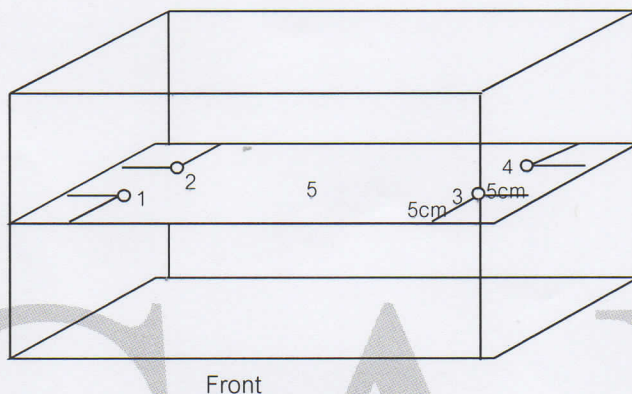
Certificate No. : 64-400532-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



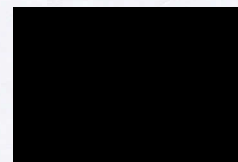
Test Point (° C)	Setting Temperature (° C)	Indicating Temperature (° C)	Measured Temperature (° C) @ Sensor					Uncertainty (± ° C)	Measured Uniformity (° C)	Measured Stability (° C)
			No.							
			1	2	3	4	5			
62.0	62.0	62.0	61.83	61.81	61.81	61.82	61.83	0.18	0.08	0.04
85.0	85.0	85.0	84.85	84.81	84.84	84.82	84.87	0.18	0.10	0.05
95.0	95.0	95.0	94.86	94.80	94.82	94.80	94.85	0.18	0.10	0.04
100.0	ccc	100.9	100.69	100.74	100.68	100.83	100.69	0.24	0.27	0.14

Remark The uncertainty is not combine uniformity of the water bath

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%

- o0o -



Certificate of Calibration

Certificate No. : 64-400224-3

Page : 1 of 2

Submitted by : Special Lab Envi and Consultant Co., Ltd.
47/91 Moo 3 Thambol Tha-it Pakkret Nonthaburi 11120

Equipment : Air Chamber (Refrigerator)

Manufacturer : Frozen

Model : CC-280C

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 2081307016

ID No. : N/A

Environment : On site calibration was carried out at the Laboratory,
Special Lab Envi and Consultant Co., Ltd.

Ambient Temperature : (28.9 to 29.8) °C

Relative Humidity : (58 to 64) %

Line Voltage : (226.0 to 226.5) V

Date of Received : 30 April 2021

Date of Calibration : 30 April 2021

Date of Issue : 30 April 2021

Calibrated by : Bunjerd Masri

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
400022 & 400023	64-400101-1	01 Sep 2021	National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor



Certificate of Calibration

Certificate No. : 64-400224-3

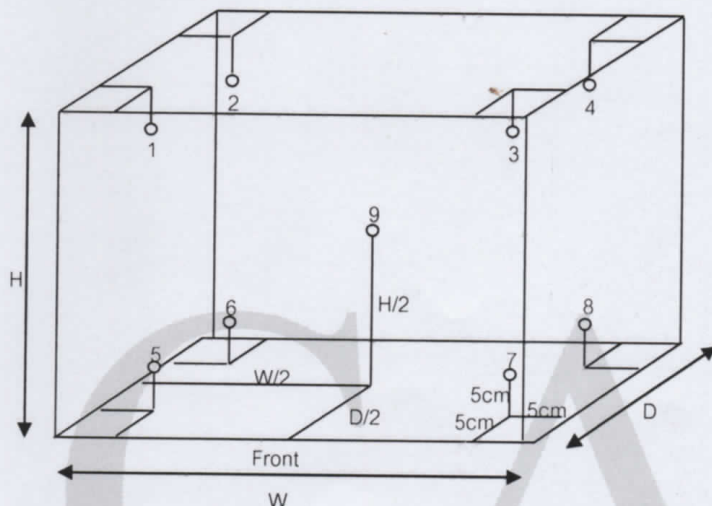
Page : 2 of 2

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 = 1.02 m

D = 0.47 m

H = 1.48 m

Capacity = 0.71 m³

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	
4.0	4.0	4.0	4.1	4.1	4.2	4.0	4.2	4.6	3.9	3.8	3.9	0.58

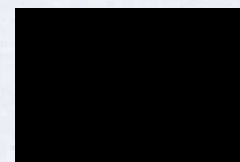
Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
4.0	4.0	4.0	0.8	0.2	1.0

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%

- o0o -



Certificate of Calibration

Certificate No. : 65-400213-3

Page : 1 of 2

Submitted by : Special Lab Envi and Consultant Co., Ltd.
47/91 Moo 3 Thambol Tha-it Pakkret Nonthaburi 11120

Equipment : Air Chamber (Refrigerator)

Manufacturer : Frozen

Model : CC-280C

Range : N/A °C

Resolution : 0.1 °C

Serial No. : 2081307016

ID No. : LB-Eq-006

Environment : On site calibration was carried out at the Laboratory,
Special Lab Envi and Consultant Co., Ltd.

Ambient Temperature : (29.5 to 30.8) °C

Relative Humidity : (54 to 60) %

Line Voltage : (226.0 to 226.5) V

Date of Received : 27 April 2022

Date of Calibration : 27 April 2022

Date of Issue : 30 April 2022

Calibrated by : Bunjerd Masri

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 RTD Probe

ID No.	Cert. No.	Due Date	Traceability
400046 & 400042	65-400041-1	28 Jul 2022	National Institute of Metrology Thailand (NIMT)

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 65-400213-3

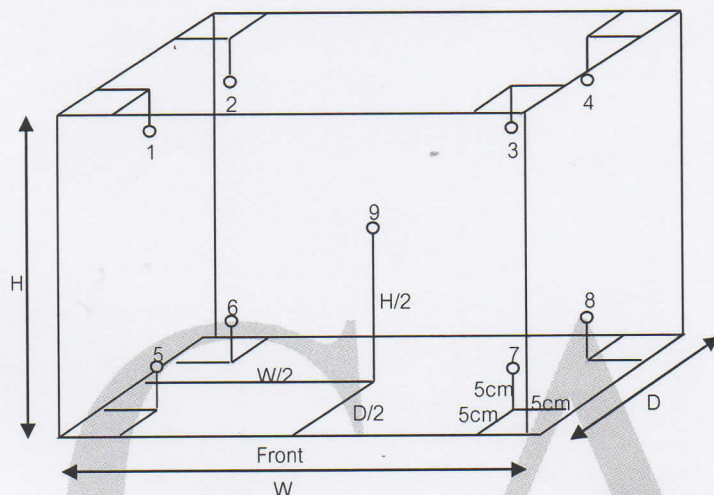
Page : 2 of 2

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 = 1.02 m

D = 0.47 m

H = 1.48 m

Capacity = 0.71 m³

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	
3.0	3.0	5.5	5.00	5.09	3.86	3.97	4.76	5.35	3.64	3.52	4.57	0.39

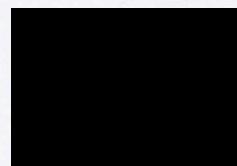
Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
3.0	3.0	5.5	1.10	0.04	1.9

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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MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>

CALIBRATION CERTIFICATE

Certificate No. : AD2105-023-0001

Date Issued : 07-May-21

Customer : Smile Laboratory Co.,Ltd.
563/1 Thoei Thai Rd., Bangwa, Phasi Charoen, Bangkok 10160

Equipment : Drycal

Manufacturer : BIOS

Model : DCL-M

Serial No. : 107934

ID No./Tag No. : SM1-DC-01

Date Received : 03-May-21

Date Calibrated : 06-May-21

Calibrated by : Mr. Somjet Onbua

Calibration Method or Calibration Procedure Used

In-house method : CP-26 by comparison against Bell Prover.

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

Result of Calibration

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

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

Approved by :

(Mr. Tassanai Suksakon)
Technical Manager

Page 1 of 3

Certificate No. : AD2105-023-0001

Environment : Ambient temperature : (23 ± 2) °C

Relative humidity : (50 ± 15) %RH

Capacity Range : 6 l/min

Calibration Media : Air

Type : Volumetric Flowmeter

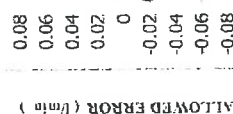
UUC Reference Condition : At atmospheric pressure and room temperature condition

Measurement Gas Flow rate function

Temperature (° C)	Pressure (kPa)	UUC (l/min)	STD (l/min)	Error (l/min)	Uncertainty (± l/min)
24.68	100.87	0.2009	0.19186	0.00904	0.0015
24.53	100.98	0.5007	0.4924	0.0083	0.0026
24.15	101.05	1.003	0.9985	0.0045	0.0035
24.15	101.61	2.003	2.0157	-0.0127	0.0053
24.22	101.71	2.507	2.5290	-0.0220	0.0066

Error = Unit Under Calibration - Standard

ERROR CHART



--- Upper Limit (l/min)
--- Lower Limit (l/min)

FLOWRATE (l/min)

Note : Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{ref} = Q_{ref} \times \frac{P_{ref}}{P_{ref}} \times \frac{T_{ref}}{T_{ref}}$$

where Q Flow rate P Absolute pressure T Absolute temperature

M Gas molecular weight , Mstandard (Air) 28.96641 g/mol

Subscript "N" Measurement condition

Subscript "Standard" Standard condition



Intech Metrological Center Co.,Ltd.
39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Samai, Bangkok 10220, Thailand

Tel. (662) 909 8820 (Auto 10 lines) www.imcinst.com



Calibration Certificate
ISO/IEC 17025



Intech Metrological Center Co.,Ltd.
39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Samai, Bangkok 10220, Thailand

Tel. (662) 909 8820 (Auto 10 lines) www.imcinst.com



Calibration Certificate
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MM20-3039
Page : 1 of 3

Customer : Smile Laboratory Co., Ltd.
Address : 563/1 Thoei Thai Rd., Bangwa, Phasicharoen, Bangkok, 10160

Description : Analytical Balance
Manufacturer : Mettler Toledo
Model : AE240
Serial No. : J69776
Identification No. : N/A
Calibration Place : Laboratory Room

Order No. : 3181/20
Received date : Oct 26, 2020
Calibration date : Oct 26, 2020
Environment Condition :
Temperature : (25 \pm 10) °C
Humidity : (50 \pm 25) %RH
Atm. Pressure : (1010 \pm 10) hPa

Calibration Method : Calibration were conducted using in-house calibration procedure CP-MM-001
According to comparison with Standard Weight Set.
The calibration methods based on UKAS - LAB 14 : 2019

Reference Standard Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
Standard Weight Set	50 mg - 2 kg	N/A	MM20-2328	Jun 19, 2021

This result of calibration was found accurate as shown on date place of calibration only.
Traceability : This measurement are traceable to the International System of Unit (SI), through
National Institute of Metrology (Thailand)

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor $k = 2$,
providing a level of confidence of not less than 95%

Calibrated by : Mr. Worasorn Thongngiw
Issue date : Oct 28, 2020
Approved by :
(Miss. Valailuck Janyanitas)

This calibration certificate shall not be reproduced other than in full except with the prior written
approval of Intech Metrological Center Co., Ltd

Rev 02/ Mar 2020

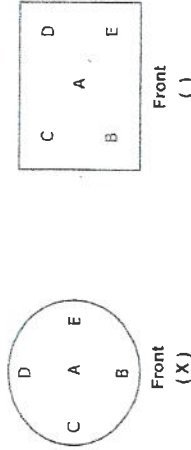
FM-MM-002

Certificate No. : MM20-3039
Page : 2 of 3

Calibration Result : Without Adjustment
Function : Repeatability
Maximum Capacity : 200 g
Resolution : 0.0001 g

Nominal Weight Value (g)	Instrument Deviation of Reading (g)
200	0.0000

Calibration Result : Without Adjustment
Function : Effect of Off Center Loading (Test at 50 % of Range)



A Mass of 100 Was Placed to various Position on the pan.
The Weight Machine Reading Obtained Is Given in The Tabel

Load (g)	A (g)	B (g)	C (g)	D (g)	E (g)	A (g)	Maximum Different (g)
100	99.9999	99.9997	99.9997	99.9998	99.9998	99.9999	0.0001

Calibration Result : Without Adjustment
Function : Effect of Tare (Test at 50 % of Range)

Nominal Tare Weight (g)	Standard Weight (g)	UUC* Reading (g)	UUC* Deviation (g)
Tare			
0.0000			
100	At 20 %	19.9998	0.0002
	At 40 %	39.9998	0.0002
	At 60 %	60.0000	0.0000
	At 80 %	79.9999	0.0001
	At 100 %	99.9998	0.0002

UUC* = Unit Under Calibration

Rev 02/ Mar 2020

FM-MM-002



GC Clarus 500/580 Preventive Maintenance (PM)

Company Name: Address (Instrument Location):		Accufas Lab Center Co., Ltd 442 Bangwek road, Bang wek , Phasicharoen ,Bangkok	
Serial Number:	560S15082006	Service Tag:	NS6AP5XFHXH
Customer Name (if applicable):	Mr. Panya	PM number:	2 of 2
Service Engineer Name:	Pramote Chalsorn	Service Order Number:	WO-0089205
Date PM Performed: (DD-MM-YYYY)	29-Oct-2020	Next PM Due Date: (DD-MM-YYYY)	29-Apr-2021

Part Number	Release	Publication Date
TH09370050	C	August 2016



Scope

The purpose of this PM is to ensure the continued functionality of the Clarus 500 and Clarus 580 GC by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

General Instructions

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM. Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Software Version	Configuration Notes
N/A	N/A	N/A	N/A

Parts Lists

Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
LF20-0053	True RMS Multimeter	1	30240033
Calibration Due Date (MM/YY)			
23-Jan-2021			

Additional Reagents and Standards Required for PM			
Part Number (if applicable)	Description	Quantity	Batch/Lot #
N/A	N/A	N/A	N/A
Expiration Date (MM/YY)			

Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for Clarus500/580 GC have been completed.	
This Clarus500/580 GC	Pass the preventive maintenance.
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative: Pranote Chaisorn	Date: 22-Oct-2020 (DD-MM-YYYY)
Authorized Customer Representative:	Date: 29-Oct-2020 (DD-MM-YYYY)

MAINTENANCE AND IPV TEST CERTIFICATE MODEL

OPTIMA 8000

Customer : ACCUFAS LAB CENTER CO., LTD		Date Tested: October 16, 2020
Recommendation Recertification		
Address : KWAENG BANGWAENG,	Period	6 Months
KHET PASIJAROEN	Recertification Due:	April 16, 2021
BANGKOK 10160	Date Last Certified:	March 27, 2020
User Name: Khun Kanjana	Visit Number:	2 of 2
Phone: 0862206802	PerkinElmer Phone:	02-719-6420 ext 206
E-mail : bonnie@accufas.com	PerkinElmer Fax:	02-318-5597

CONFIGURATION TESTED			
MODEL	SERIAL NUMBER	SOFTWARE	
OPTIMA 8000	078S1507024C	ICP Syngistix Version 1.0	
TESTED EQUIPMENT	CALIBRATION NUMBER	EXPIRATION	
IPV Method			
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE	
Multielement Standard	N069-1579	May 30, 2021	
Instrument Cal. STD4	N930-0221	June 30, 2021	
CUSTOMER SUPPLIED	COMMENTS	CUSTOMER INITIALS	
2 % HNO3			
10 % HNO3			

MAINTENANCE AND IPV TEST CERTIFICATE MODEL

OPTIMA 8000

SERIAL NUMBER: 078S1507024C	DATE TESTED: October 16, 2020
1. MECHANICAL CHECKS	
A. Inspect and clean all fans and filters.	<input type="checkbox"/> OK
B. Inspect and replace as necessary, all torch components including the RF coil.	<input type="checkbox"/> OK
C. Inspect all tubing for sign of clacking or leaking.	<input type="checkbox"/> OK
D. Adjust water and gas pressure regulator settings.	<input type="checkbox"/> OK
E. Inspect and leak check pneumatics drawers.	<input type="checkbox"/> OK
F. Clean the exterior of the instrument.	<input type="checkbox"/> OK
2. OPTICAL CHECKS	
A. Inspect and clean all optical components.	<input type="checkbox"/> OK
B. As required, check and replace all purge filters.	<input type="checkbox"/> OK
C. Redcheck optical alignment.	<input type="checkbox"/> OK
3. COOLING SYSTEM CHECKS	
A. Perform preventive maintenance on chiller.	<input type="checkbox"/> OK
B. Flush out the chiller every year.	<input type="checkbox"/> OK
4. PERFORMANCE CHECKS	
A. Torch View Alignment	<input type="checkbox"/> OK
B. Wavelength Calibration	<input type="checkbox"/> OK

UUT Meter Console Information

Model #: XD-502-MV
 Serial #: A1908163
 DGM Model #: SK-25-EX
 DGM Serial #: 20194010
 Initial Y_{sc}: 1.0000

Calibration Conditions

Bar. Pressure (mb): 1009
 Ambient Temperature (°C): 23.6
 Relative Humidity (%): 69%
 Altitude (m): 6.0
 Bar. Pressure Corr. (mm Hg): 756.3

Factors/Conversions

Std Temp (K): 293.15
 Std Press. (mm Hg): 760
 K₁ (K/mm Hg): 0.3857

Reference Equipment

Calibration Meter Model: DGM-200H
 Cal Due Date: 04-May-21
 Serial #: 0000026
 Gamma: 0.9962

UUT Meter (DGM)

Run Time (seconds)	Orifice, ΔH (mm H ₂ O)	Pulse Count			Meter Temperature (°C)		Meter Pressure (in H ₂ O)	Volume (L)			Outlet Temperature (°C)	
		Initial	Final	Total	Initial	Final		Initial	Final	Total	Initial	Final
0	P _{mg}	C _{tot}	C _{total}	C _{total}	t _{in}	t _{out}	P _w	V _{in}	V _{out}	V _w	t _m	t _{out}
280.61	120.00	0	92729	92729	25.0	26.0	-14.0	0.0	167.0	167.0	24.0	24.0
340.67	80.00	0	92125	92125	26.0	27.0	-10.0	0.0	164.0	164.0	24.0	24.0
430.77	50.00	0	92363	92363	27.0	28.0	-7.0	0.0	163.0	163.0	24.0	25.0
600.81	25.00	0	90770	90770	28.0	29.0	-4.0	0.0	158.4	158.4	25.0	25.0
800.79	13.00	0	92915	92915	29.0	29.0	-2.0	0.0	162.1	162.1	25.0	26.0

Reference Meter

Standardized Data			Scaling Factor		Calibration Results			
Reference Meter		Test Meter	Volume Conversion		Correction Factor		ΔH @ (mm H ₂ O)	
Std. Volume	Std. Flow Rate	Totalizer	Scaling Fac.	Std. Vol.	Value	Variance	0.0212 SCMM	Variance
V _{w,ref} (L)	Q _{w,ref} (L/min)	Counts _{test}	Y _{sc}	V _{m,ref} (L)	Y	ΔY	ΔH@	ΔΔH@
157.670	33.713	91636	1.72E-03	159.0	0.9919	-0.0081	43.5	-0.035
156.475	27.559	90387	1.73E-03	156.8	0.9980	-0.0020	44.0	0.439
156.424	21.788	90058	1.74E-03	156.2	1.0013	0.0013	44.4	0.831
152.905	15.270	87998	1.74E-03	152.6	1.0017	0.0017	45.6	2.048
156.942	11.759	89823	1.75E-03	155.8	1.0072	0.0072	40.3	-3.283
			1.73E-03 = Avg.	1.0000 = Y Avg.		43.57 = ΔH@ Avg.		

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.

Note: For 10% orifice pressure differential that equates to 0.0212 mm Hg at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2 mm Hg (5 mm Hg).

Pass/Fail Result: **Pass**

Console Input Value: **1.7347** Meter

Calibrate By:

Approved By:

Date: 26-Jan-2021

The instruments listed and described on this certificate have been calibrated against standards traceable to the National Institute of Standards and Technology (NIST) and in reference to EPA Method 5, Section 10.3.1

Neediss Supply Instrument Co., Ltd. - 536 Soi Bangkhao 7 Bangkhao Bangkok 10160 | Tel: (662) 8023980 Web: www.neediss.com

Nomenclature

P_{at}: Barometric Pressure
 DGM: Dry Gas Meter
 K₁: Constant based on standard temp and press
 t: Run time, in minutes
 P_{mg}: ΔH (Meter Pressure, gauge)
 V: Volume collected by test meter, corrected for STP
 Q_{std}: Calculated flow rate of test meter
 K₂: Critical orifice coefficient
 P_w: Measured pressure of reference meter
 T_m: Temperature measured in reference meter
 T_{sc}: Temperature measured in test meter
 Y: Ratio of volume collected from test meter and orifice
 Y_{sc}: Scaling Factor
 Counts_{std}: Number of pulse counts, standardized
 C_{total}: Number of raw pulse counts of a calibration run

Equations

$$V_{std} = Y \cdot K_1 \cdot \frac{V_{ref} \cdot (P_{ref} + P_{mg})}{T_{ref}}$$

$$V_{std} = Counts_{std} \cdot Y_{sc}$$

$$Counts_{std} = K_2 \cdot \frac{C_{total} \cdot (P_{ref} + P_{mg})}{T_{ref}}$$

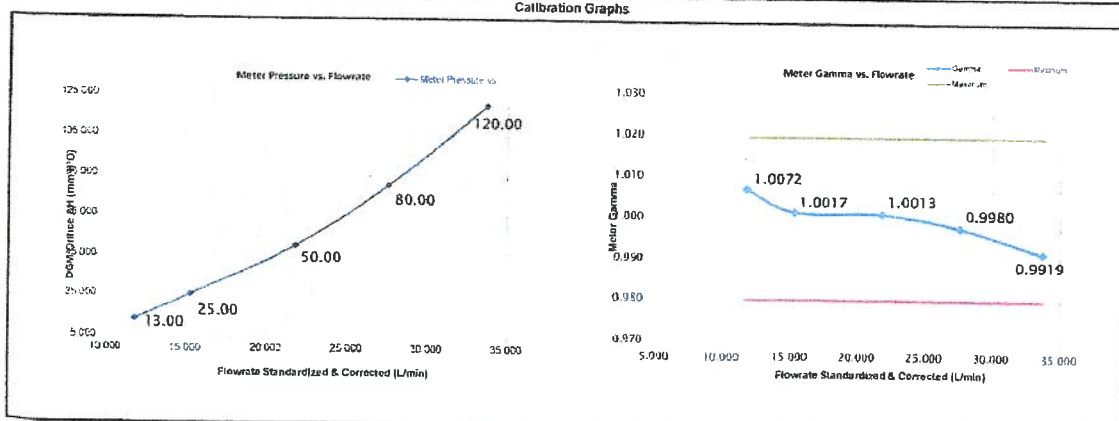
$$Q_{std} = \frac{V_{std}}{t}$$

$$K_1 = \frac{1.013}{P_{ref}}$$

$$Y = \frac{V_{std}}{V_{ref}}$$

$$Y_{sc} = \frac{P_{ref} \cdot (1.013 \cdot 1000) \cdot P_{ref} \cdot \frac{1}{T_{ref}}}{T_{sc} \cdot (P_{ref} + P_{mg})}$$

Calibration Train





Sampling Probe and Pitot Validation

Sampling System Equipment Information

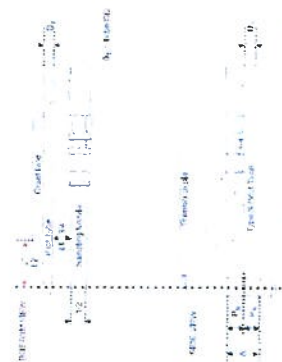
Probe Serial:	Apex 1 in , 3 ft
Probe Number:	
Pitot tube Number:	A9370
Pitot tube Type:	S Type 3/8 Inc.
Validation method:	Standard Probe 1 in. and 1/2 in Sampling Nozzle

Validation Conditions and Equipment

Reference No:	ET123456
Digital Callipers:	12-1057
Temperature:	23.0 °C
Validation Date:	28 Jan 21

Sampling Probe Validation with Tune up

Measure and Alignment with 1/2" Sampling Nozzle (12.7 mm)



Measured

L_1	= 3.45 cm	(1.805 cm or 3/4 in)
L_2	= 5.50 cm	(5.08 cm or 2.0 in)
D_1	= 0.607 cm.	(3/8 in)
A	= 2.11 cm	(2.1 D ₁ < A ≤ 3D ₁)
$A/2D_1$	= 1.072 cm.	(1.05 P _A / D ₁ ≤ A ≤ 1.5)

Pitot Tube Validations and Angles measurement Result

Measure Result after Maintenance and Adjustable

P₃ Size

α_1	= 2.09 °	≤ 10°
β_1	= 0.40 °	≤ 5°

P_A Size

α_2	= 1.80 °	≤ 10°
β_2	= 0.20 °	≤ 5°

Angles measurement

W	= 2.20 °	0.081 cm	W < 0.09 cm (1/32 in)
Z	= 2.40 °	0.067 cm	Z < 0.032 cm (1/8 in)

Standard Range

Can be use 0.84 for C_{pt} if the type of face opening misalignment show above with not affect the base line value of C_{pt}



Validation By: [Signature] Approved By: [Signature] Date: 28 Jan 21



Nozzle Validation

Sampling System Equipment Information

Console Model Number	XD-502-MV
Console Serial Number	A1908163
DGM Model Number	SK-25-EX
DGM Serial Number	20194010

Validation Conditions

Date	26 Jan 21
Calibration Reference No.	
Barometric Pressure	760 mm Hg
Calibration	Vernier 0-200mm
Validation Method	US EPA Method

Calibration Data						Results	
Nozzle ID	Nozzle Diameter					Different	(D ₁ + D ₂ + D ₃) / 3
Sizes	D ₁	D ₂	D ₃	ΔD		D avg	
	mm	mm	mm	mm	mm	mm	mm
4	3.17	3.13	3.11	0.012	0.012	3.123	3.123
5	3.96	3.95	3.96	0.006	0.012	3.957	3.957
6	4.77	4.74	4.76	0.012	0.015	4.753	4.753
7	5.30	5.27	5.29	0.015	0.015	5.287	5.287
10	7.92	7.90	7.88	0.015	0.015	7.883	7.883
11	8.71	8.95	8.82	0.081	0.081	8.857	8.857
16	12.70	12.58	12.52	0.050	0.050	12.573	12.573

Where :

D₁, D₂, D₃ = There difference nozzle diameters . mm : diameter must be within 0.025 mm

ΔD = Maximum difference between any two diameters, must be ≤ 0.100 mm

D avg = (D₁ + D₂ + D₃) / 3



Validation By: [Signature]

Approved By: [Signature]

Date: 26-Jan-21





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Smile Laboratory Co., Ltd.

563/1 ถนนเอกอัคราช แขวงบางกะปิ เขตจตุจักร กรุงเทพฯ 10160 โทรศัพท์ 02-227-0265 โทรสาร 02-454-0317
563/1 Thot Thai Rd., Bangwa, Phasicharoen, Bangkok 10160 Tel. 02-227-0265 Fax. 02-454-0317

TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information

Sampler Location	บริษัท ปิ่นทองกรุ๊ป แวนเนจเนชั่นท์ แอนด์ คอนซัลแตนท์ จำกัด	Date	09 January 2022
Project Site	-	Person	Mr.Tannakorn Tawisakulrat

Calibration Orifice

Transfer Standard Type	Orifice	Q _{std} Slope (m)	2.10372
Calibrator Model	TE-5025A	Q _{std} Intercept (b)	-0.03890
Calibrator Serial Number	3092		

Calibration Information

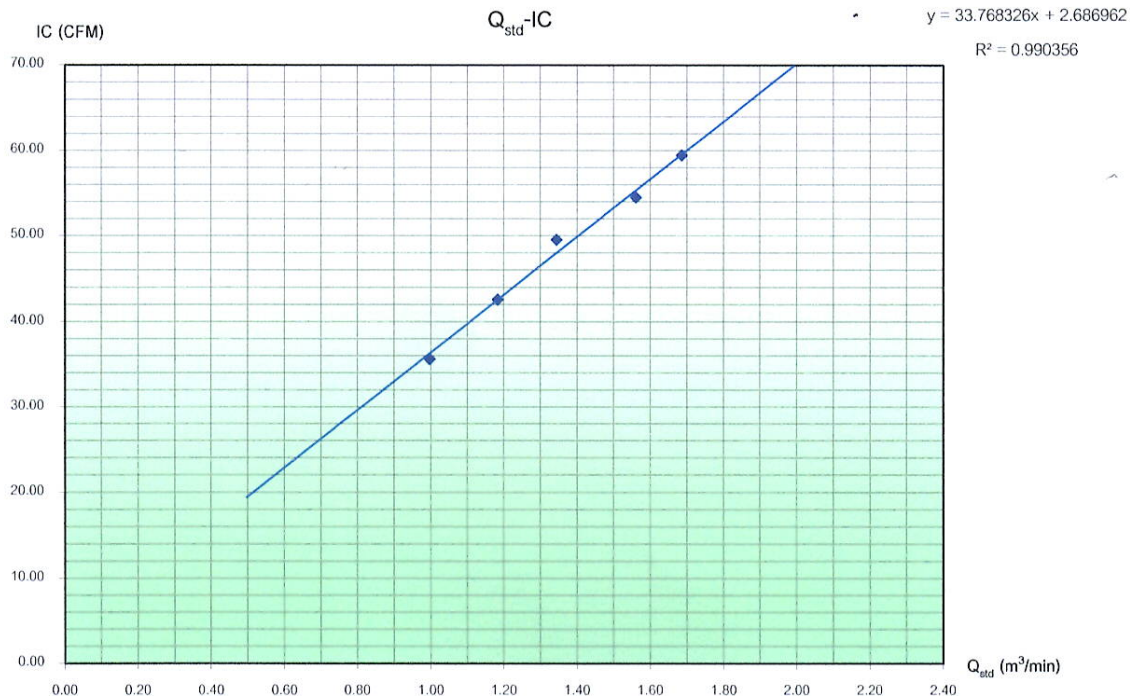
Sampler Number	TSP No.01	Motor Serial Number	1203-415	Recorder Serial Number	596
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Test No.	Pressure Drop Across Orifice (ΔH ₂ O) (inH ₂ O)			(A)	(X)	(I)	(Y)	Temperature (°K = °C+273)	Barometric Pressure (mmHg)
	Positive	Negative	ΔH ₂ O	$[\Delta H_2O(P_a/P_{std})(T_{std}/T_a)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m ³ /min)	Sample Flow Rate Indication (ft ³ /min)	$IC = [((P_a/P_{std})(T_{std}/T_a))^{1/2}]$ (ft ³ /min)		
1	2.2	2.1	4.30	2.05646	0.99603	36.0	35.70	303.0	760.0
2	3.2	2.9	6.10	2.44936	1.18279	43.0	42.64	303.0	760.0
3	4.1	3.8	7.90	2.78741	1.34348	50.0	49.59	303.0	760.0
4	5.4	5.3	10.70	3.24398	1.56051	55.0	54.54	303.0	760.0
5	6.3	6.2	12.50	3.50624	1.68518	60.0	59.50	303.0	760.0
Average								303.0	760.0

Linear Regression : y = mX + b

Slope (m)	33.768326
Intercept (b)	2.686962
R-Square (R ²)	0.990356
Correlation Coefficient (r)	0.995166

Andersen Instruments, Inc.



Calibrated By

Mr.Tannakorn Tawisakulrat



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Smile Laboratory Co., Ltd.

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563/1 Thoei Thai Rd., Bangwa, Phasicharoen, Bangkok 10160 Tel. 02-227-0265 Fax. 02-454-0317

TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information

Sampler Location	บริษัท ปิ่นทองกรุ๊ป แมนเนจเม้นท์ แอนด์ คอนซัลแตนท์ จำกัด	Date	09 January 2022
Project Site	-	Person	Mr.Tannakorn Tawisakulrat

Calibration Orifice

Transfer Standard Type	Orifice	Q _{std} Slope (m)	2.10372
Calibrator Model	TE-5025A	Q _{std} Intercept (b)	-0.03890
Calibrator Serial Number	3092		

Calibration Information

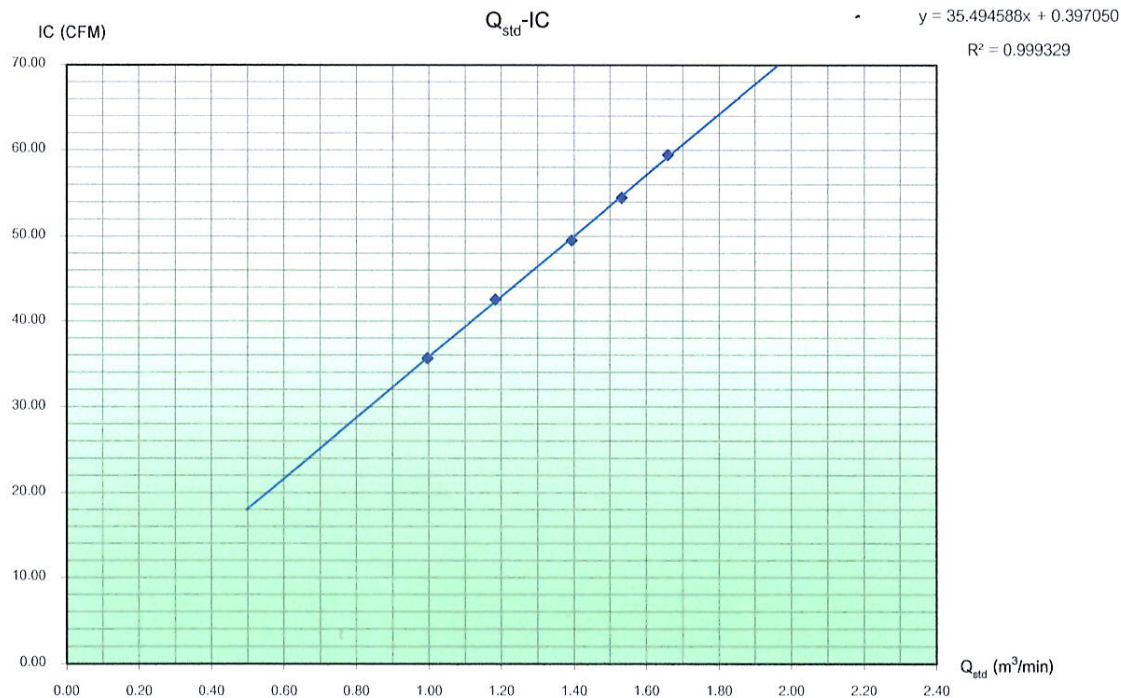
Sampler Number	TSP No.02	Motor Serial Number	1203-421	Recorder Serial Number	598
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Test No.	Pressure Drop Across Orifice (ΔH ₂ O) (inH ₂ O)			(A)	(X)	(I)	(Y)	Temperature (*K = °C+273)	Barometric Pressure (mmHg)
	Positive	Negative	ΔH ₂ O	$[\Delta H_2O(P_a/P_{std})(T_{std}/T_a)]^{1/2}$	Q _{std} = (1/m)[(A-b)] (m ³ /min)	Sample Flow Rate Indication (ft ³ /min)	IC = $I[(P_a/P_{std})(T_{std}/T_a)]^{1/2}$ (ft ³ /min)		
1	2.2	2.1	4.30	2.05646	0.99603	36.0	35.70	303.0	760.0
2	3.1	3.0	6.10	2.44936	1.18279	43.0	42.64	303.0	760.0
3	4.3	4.2	8.50	2.89132	1.39288	50.0	49.59	303.0	760.0
4	5.2	5.1	10.30	3.18277	1.53142	55.0	54.54	303.0	760.0
5	6.1	6.0	12.10	3.44969	1.65829	60.0	59.50	303.0	760.0
Average								303.0	760.0

Linear Regression : y = mX + b

Slope (m)	35.494588
Intercept (b)	0.397050
R-Square (R ²)	0.999329
Correlation Coefficient (r)	0.999664

Andersen Instruments, Inc.



Calibrated By

Mr.Tannakorn Tawisakulrat

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563/1 Thoei Thai Rd., Bangwa, Phasicharoen, Bangkok 10160 Tel. 02-227-0265 Fax. 02-454-0317

PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information

Sampler Location	บริษัท ปิ่นทองกรุ๊ป แคมเปญเนชั่น แอนด์ คอนซัลแตนท์ จำกัด	Date	09 January 2022
Project Site	-	Person	Mr.Tannakorn Tawisakulrat

Calibration Orifice

Transfer Standard Type	Orifice	Q _{std} Slope (m)	2.10372
Calibrator Model	TE-5025A	Q _{std} Intercept (b)	-0.03890
Calibrator Serial Number	3092		

Calibration Information

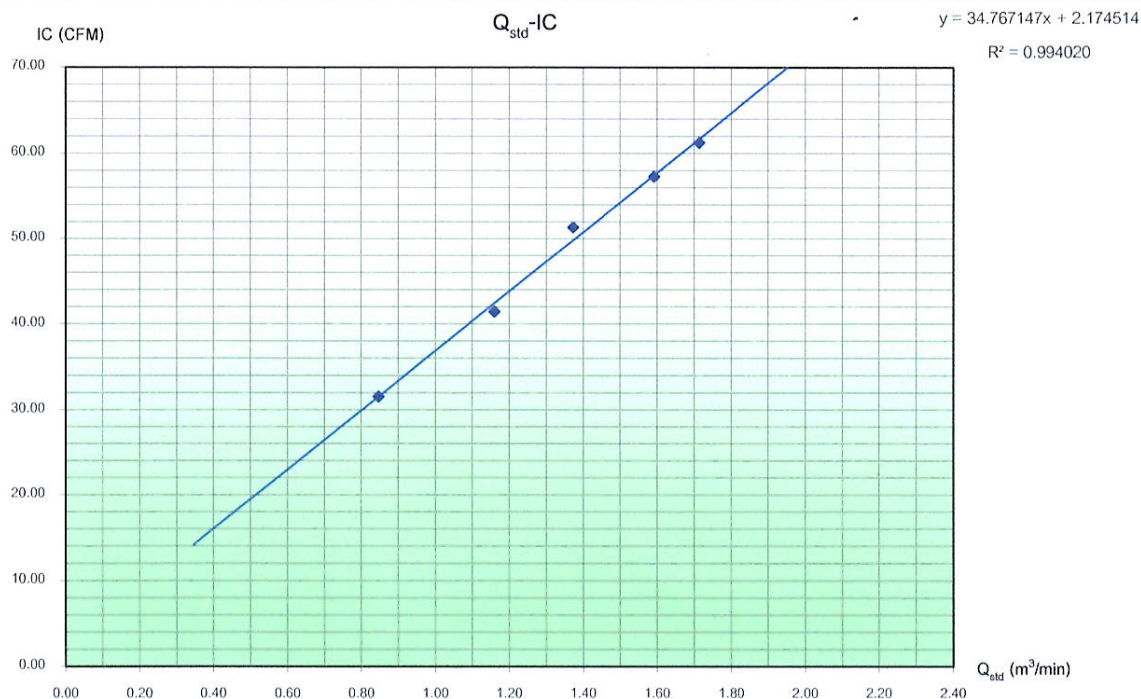
Sampler Number	PM10 No.01	Motor Serial Number	1203-440	Recorder Serial Number	604
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Test No.	Pressure Drop Across Orifice (ΔH_2O) (inH ₂ O)			(A)	(X)	(I)	(Y)	Temperature ("K = °C+273)	Barometric Pressure (mmHg)
	Positive	Negative	ΔH_2O	$[\Delta H_2O(P_a/P_{std})(T_{std}/T_a)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m ³ /min)	Sample Flow Rate Indication (ft ³ /min)	$IC = I[(P_a/P_{std})(T_{std}/T_a)]^{1/2}$ (ft ³ /min)		
1	1.6	1.5	3.10	1.74036	0.84577	32.0	31.63	305.0	760.0
2	3.0	2.9	5.90	2.40096	1.15978	42.0	41.52	305.0	760.0
3	4.2	4.1	8.30	2.84772	1.37215	52.0	51.40	305.0	760.0
4	5.7	5.5	11.20	3.30801	1.59095	58.0	57.33	305.0	760.0
5	6.6	6.4	13.00	3.56394	1.71260	62.0	61.28	305.0	760.0
Average								305.0	760.0

Linear Regression : $y = mX + b$

Slope (m)	34.767147
Intercept (b)	2.174514
R-Square (R ²)	0.994020
Correlation Coefficient (r)	0.997006

Andersen Instruments, Inc.



Calibrated By

Mr.Tannakorn Tawisakulrat

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บริษัท สไมล์ แล็บอราทอรี จำกัด

Smile Laboratory Co., Ltd.

563/1 ถนนเอกอภิมหาเมืองบางนา แขวงบางนา เขตภาษีเจริญ กรุงเทพฯ 10160 โทรศัพท์ 02-227-0265 โทรสาร 02-454-0317
563/1 Thoei Thai Rd., Bangwa, Phasicharoen, Bangkok 10160 Tel. 02-227-0265 Fax. 02-454-0317

PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information

Sampler Location	บริษัท ปิ่นทองกรุ๊ป แมนเนจเม้นท์ แอนด์ คอนซัลแตนท์ จำกัด	Date	09 January 2022
Project Site	-	Person	Mr.Tannakorn Tawisakulrat

Calibration Orifice

Transfer Standard Type	Orifice	Q _{std} Slope (m)	2.10372
Calibrator Model	TE-5025A	Q _{std} Intercept (b)	-0.03890
Calibrator Serial Number	3092		

Calibration Information

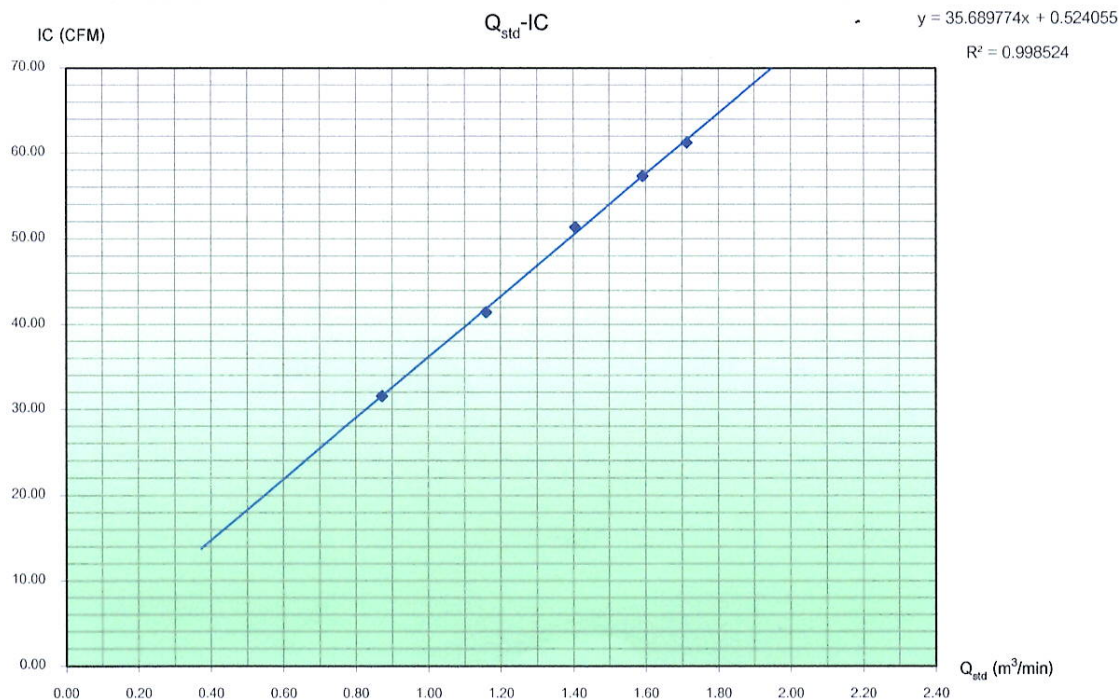
Sampler Number	PM10 No.02	Motor Serial Number	1203-444	Recorder Serial Number	606
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Test No.	Pressure Drop Across Orifice (ΔH ₂ O) (inH ₂ O)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure
	Positive	Negative	ΔH ₂ O	[ΔH ₂ O(P _a /P _{std})(T _{std} /T _a)] ^{1/2}	Q _{std} = (1/m)[(A-b)] (m ³ /min)	Sample Flow Rate Indication (ft ³ /min)	IC = [(P _a /P _{std})(T _{std} /T _a)] ^{1/2} (ft ³ /min)	(°K = °C+273)	(mmHg)
1	1.7	1.6	3.30	1.79562	0.87204	32.0	31.63	305.0	760.0
2	3.0	2.9	5.90	2.40096	1.15978	42.0	41.52	305.0	760.0
3	4.4	4.3	8.70	2.91553	1.40438	52.0	51.40	305.0	760.0
4	5.7	5.5	11.20	3.30801	1.59095	58.0	57.33	305.0	760.0
5	6.6	6.4	13.00	3.56394	1.71260	62.0	61.28	305.0	760.0
Average								305.0	760.0

Linear Regression : y = mX + b

Slope (m)	35.689774
Intercept (b)	0.524055
R-Square (R ²)	0.998524
Correlation Coefficient (r)	0.999262

Andersen Instruments, Inc.



Calibrated By

Mr.Tannakorn Tawisakulrat

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Laboratory Co., Ltd.



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: 15 November 2021

Instruments Information

Analyzer Type: NOx Analyzer Model: 200A	Manufacturer API Environmental S/N: 0615
--	---

Calibration System

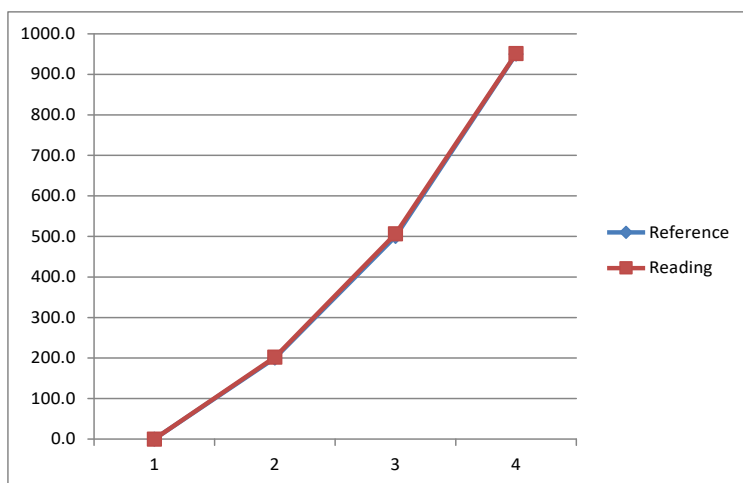
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1924	NO Conc 957.2 PPM SO2 Conc 960.7 PPM CO Conc 960.4 PPM Cylinder Number EB0123127 Expire Date: 11 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	Reference	Reading	ERROR	%ERROR
ZERO	0.0	0.0	0.00	0.00
1	200.0	202.0	2.00	1.00
2	500.0	506.7	6.70	1.34
3	950.0	951.2	1.20	0.13
				0.62



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: 15 November 2021

Instruments Information

Analyzer Type: NOx Analyzer Model: 200A	Manufacturer API Environmental S/N: 1648
--	---

Calibration System

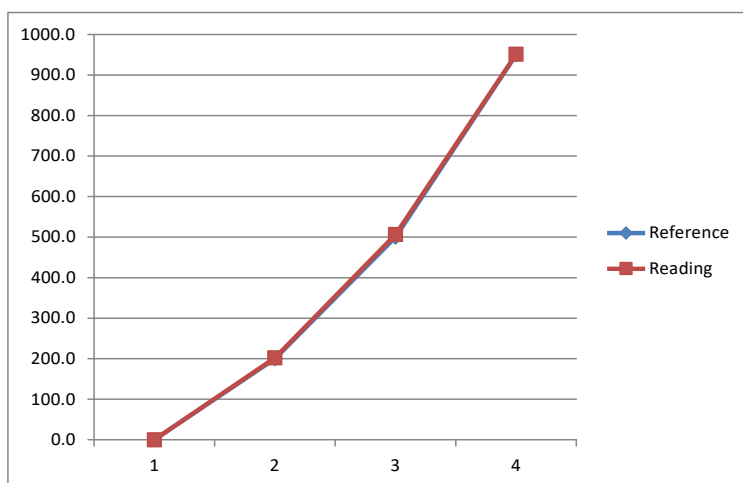
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1924	NO Conc 957.2 PPM SO2 Conc 960.7 PPM CO Conc 960.4 PPM Cylinder Number EB0123127 Expire Date: 11 Oct. 2027

Environment: Temperature 25.5 °C

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CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	Reference	Reading	ERROR	%ERROR
ZERO	0.0	0.0	0.00	0.00
1	200.0	202.0	2.00	1.00
2	500.0	506.7	6.70	1.34
3	950.0	951.2	1.20	0.13
				0.62



Calibrate By : Mr. Pasagorn Samol

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 13 December 2021

Certificate No. 114/21

Page : 1 of 2

Manufacture Yong Instruments

Type four blade helicoid propeller

Model No. 05103

Mfg Code Logger 309017543

Transmitter -

Customer ENVIR SERVICE CO., LTD.

42 Raminthra 14 yeak 9, Tha Raeng,

Bangkhen, Bangkok 10230

Calibration Condition : Temperature 25.2 °C

Barometric Pressure 1012.8 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

STANDARD THERMOMETER : Theodor Friedrich : Dry No. 8390/94 Wet No. 8389/94

: Thermoschneider No. 918802

STANDARD BAROMETER : Digital Barometer Vaisaia Type RTB220 No. V1220015

Calibrated by :



Mr. Pasagorn Samol

The Result of Calibration

Date of Issue 13 February 2021

Certificate No. 114/21

Page : 2 of 2

Standard	HOOK GAGE NO 1425			TESTED ANEMOMETER			
	Pressure	Vacuum	Pressure	Pressure	Correction	Velocity	Correction
Ultrasonic Anemometer m/sec	inches	inches	hPa	hPa	hPa	m/sec	m/sec
1.00	-	-	-	-	-	0.7	0.30
3.02	-	-	-	-	-	2.7	0.32
5.04	-	-	-	-	-	4.8	0.24
7.03	-	-	-	-	-	6.7	0.33
9.01	-	-	-	-	-	8.7	0.31
11.03	-	-	-	-	-	10.7	0.33
13.01	-	-	-	-	-	12.4	0.61
15.03	-	-	-	-	-	14.1	0.93
17.05	-	-	-	-	-	16.4	0.65
20.02	-	-	-	-	-	19.1	0.92

Wind Aloft Plotting Board.	
US. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :



Mr. Pasagorn Samol

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 9 February 2021

Certificate No. 241/21

Page : 1 of 2

Manufacture NRG Instruments

Type 3 Cup Anemometer

Model No. 40C

Mfg Code Logger 428000467

Transmitter -

Customer ENVIR SERVICE CO., LTD.

42 Raminthra 14 yeak 9, Tha Raeng,

Bangkhen, Bangkok 10230

Calibration Condition : Temperature 25.2 °C Barometric Pressure 1012.8 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

STANDARD THERMOMETER : Theodor Friedrich : Dry No. 8390/94 Wet No. 8389/94

: Thermoschneider No. 918802

STANDARD BAROMETER : Digital Barometer Vaisaia Type RTB220 No. V1220015

Calibrated by :



Mr. Pasagorn Samol

The Result of Calibration

Date of Issue 9 February 2021

Certificate No. 241/21

Page : 2 of 2

Standard	HOOK GAGE NO 1425			TESTED ANEMOMETER			
	Pressure	Vacuum	Pressure	Pressure	Correction	Velocity	Correction
Ultrasonic Anemometer m/sec	inches	inches	hPa	hPa	hPa	m/sec	m/sec
1.00	-	-	-	-	-	0.9	0.10
3.02	-	-	-	-	-	2.9	0.12
5.04	-	-	-	-	-	4.8	0.24
7.03	-	-	-	-	-	6.9	0.13
9.01	-	-	-	-	-	8.7	0.31
11.03	-	-	-	-	-	10.7	0.33
13.01	-	-	-	-	-	12.5	0.51
15.03	-	-	-	-	-	14.1	0.93
17.05	-	-	-	-	-	16.4	0.65
20.02	-	-	-	-	-	19.1	0.92

Wind Aloft Plotting Board.	
US. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated by :



Mr. Pasagorn Samol



Calibration Test Report

Calibrated at : บริษัท น้ำตาลวังขนาย จำกัด
Reference Standard : Sound Calibrator Class 1 Model QC-10, Quest/USA
Serial No.QIG030022
Date of Calibration : 4 Feb. 2021

Date	Serial No.	Reference Standard (dB)	Insrument Reading (dB)	Adjust	Error (dB)	After Use	Error (dB)	Inspection Result	Calibrated By
11/1/2565	112033	114.0	114.0	114.0	0.0	114.0	0.0	Pass	ศุภกานต์ ศ.
11/1/2565	142027	114.0	114.0	114.0	0.0	114.0	0.0	Pass	ศุภกานต์ ศ.
11/1/2565	142028	114.0	114.0	114.0	0.0	114.0	0.0	Pass	ศุภกานต์ ศ.
11/1/2565	169544	114.0	114.0	114.0	0.0	114.0	0.0	Pass	ศุภกานต์ ศ.
13/1/2565	169549	114.0	114.0	114.0	0.0	114.0	0.0	Pass	ศุภกานต์ ศ.
13/1/2565	142028	114.0	114.0	114.0	0.0	114.0	0.0	Pass	ศุภกานต์ ศ.
13/1/2565	BBG030004	114.0	114.0	114.0	0.0	114.0	0.0	Pass	ศุภกานต์ ศ.

หมายเหตุ : Error \pm 1.5 dB



Approve By : _____

(นายพรทรี ภูแข่งหมอก)

Date : 11-13 / 01 / 2565

Request No. 21-65/0257

MTC No. EEL. BP. 74/0165

CALIBRATION CERTIFICATE

Submitted by : PINTHONG GROUP MANAGEMENT AND CONSULTANTS CO., LTD.

Address : 27 Rama 2 Road, Tha Kham, Bang Khun Thian, Bangkok 10150.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Calibrator

Manufacturer : Quest Technologies

Model : QC-10

Serial No. : QIG030022

Ambient Environment

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

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

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Keithley 2015-P S/N 4106495.

7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 21 Jan. 2022

Date of Calibration : 4 Feb. 2022

1 / 2

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0257

MTC No. EEL. BP. 74/0165

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 114 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 %RH.

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer4180	113.96	-0.04	± 0.10	± 0.40 dB

2. Frequency


Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	994.2	-5.8	± 1.5	$\pm 1.0\%$

3. Total Distortion


Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	0.56	± 0.50	$\pm 3.0\%$

- Note :
1. No adjustment.
 2. The calibrator pressure correction was not included.
 3. The microphone volume correction was not included.

Calibrated by :


(Mr.Tawikiat Iamsamran)

Approved by :


(Mr.Prawate Kluaypa)

Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 4 Feb. 2022

Date of Issue : 4 Feb. 2022

Ref : 2011265012100282001

2 / 2

End of Certificate

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4



Certificate of Calibration

Certificate No.: WK2203-009-6

Page 1 of 2

Customer : PINTHONG GROUP MANAGEMENT AND CONSULTANTS CO.,LTD.
27 Rama 2 Road, Thakham, Bangkuntien,
Bangkok 10150 Thailand

Instrument : Sound Level Meter
Manufacturer : N/A
Model : TYPE 6236
Serial No. : 112033
Identity No. : N/A
Range : See to Data
Resolution : 0.1 dB
Calibration Method : CP-WK-A01

Ambient Temperature : $(23.0 \pm 2) ^\circ\text{C}$
Humidity : $(50.0 \pm 15) \% \text{RH}$
Received Date : 2-Mar-22
Calibrated Date : 7-Mar-22
Issued Date : 7-Mar-22
Calibrated Location : In Lab

Reference standard instruments :

<u>Instrument</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Level Calibrator	10049416	EEL.BP.120/0164	25-Jan-23	TISTR

TISTR : Thailand Institute of Scientific and Technological Research.

This result calibrate was found accurate as shown on date place of calibrate only

This certificate is traceability to the International System of Unit (SI)

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

Calibrated by : Mr. Chaiyo Obchoei

Approved by :

Ms. Budsagorn Patcha
Authorized Signatory

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Calibration Results

Certificate No. : WK2203-009-6

Page 2 of 2

Calibration Result of the Accuracy

Function : Sound Level Measurement at 1 kHz

Range : A Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.1	0.1	0.20

Range : A Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.1	0.1	0.20

Range : C Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.1	0.1	0.20

Range : C Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.1	0.1	0.20

() Without Adjustment (X) After Adjustment

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**** End of Certificate****



Certificate of Calibration

Certificate No.: WK2203-009-7

Page 1 of 2

Customer : PINTHONG GROUP MANAGEMENT AND CONSULTANTS CO.,LTD.
27 Rama 2 Road, Thakham, Bangkuntien,
Bangkok 10150 Thailand

Instrument : Sound Level Meter
Manufacturer : N/A
Model : TYPE 6236
Serial No. : 142027
Identity No. : N/A
Range : See to Data
Resolution : 0.1 dB
Calibration Method : CP-WK-A01

Ambient Temperature : $(23.0 \pm 2) ^\circ\text{C}$
Humidity : $(50.0 \pm 15) \% \text{RH}$
Received Date : 2-Mar-22
Calibrated Date : 7-Mar-22
Issued Date : 7-Mar-22
Calibrated Location : In Lab

Reference standard instruments :

<u>Instrument</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Level Calibrator	10049416	EEL.BP.120/0164	25-Jan-23	TISTR

TISTR : Thailand Institute of Scientific and Technological Research.

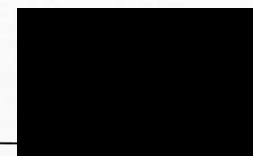
This result calibrate was found accurate as shown on date place of calibrate only

This certificate is traceability to the International System of Unit (SI)

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

Calibrated by : Mr. Chaiyo Obchoei

Approved by :



Ms. Budsagorn Patcha

Authorized Signatory

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Calibration Results

Certificate No. : WK2203-009-7

Page 2 of 2

Calibration Result of the Accuracy

Function : Sound Level Measurement at 1 kHz

Range : A Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.2	0.2	0.20
114	114.3	0.3	0.20

Range : A Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.2	0.2	0.20
114	114.3	0.3	0.20

Range : C Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.2	0.2	0.20
114	114.3	0.3	0.20

Range : C Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.2	0.2	0.20
114	114.3	0.3	0.20

(X) Without Adjustment () After Adjustment

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**** End of Certificate****



Certificate of Calibration

Certificate No.: WK2203-009-5

Page 1 of 2

Customer : PINTHONG GROUP MANAGEMENT AND CONSULTANTS CO.,LTD.
27 Rama 2 Road, Thakham, Bangkuntien,
Bangkok 10150 Thailand

Instrument : Sound Level Meter
Manufacturer : N/A
Model : TYPE 6236
Serial No. : 142028
Identity No. : N/A
Range : See to Data
Resolution : 0.1 dB
Calibration Method : CP-WK-A01

Ambient Temperature : $(23.0 \pm 2) ^\circ\text{C}$
Humidity : $(50.0 \pm 15) \% \text{RH}$
Received Date : 2-Mar-22
Calibrated Date : 7-Mar-22
Issued Date : 7-Mar-22
Calibrated Location : In Lab

Reference standard instruments :

<u>Instrument</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Level Calibrator	10049416	EEL.BP.120/0164	25-Jan-23	TISTR

TISTR : Thailand Institute of Scientific and Technological Research.

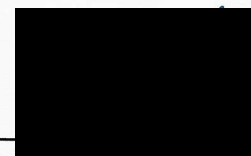
This result calibrate was found accurate as shown on date place of calibrate only

This certificate is traceability to the International System of Unit (SI)

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

Calibrated by : Mr. Chaiyo Obchoei

Approved by :



Ms. Budsagorn Patcha

Authorized Signatory

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Calibration Results

Certificate No. : WK2203-009-5

Page 2 of 2

Calibration Result of the Accuracy

Function : Sound Level Measurement at 1 kHz

Range : A Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.1	0.1	0.20

Range : A Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.1	0.1	0.20

Range : C Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.1	0.1	0.20

Range : C Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.1	0.1	0.20

() Without Adjustment (X) After Adjustment

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**** End of Certificate****



Certificate of Calibration

Certificate No.: WK2203-009-2

Page 1 of 2

Customer : PINTHONG GROUP MANAGEMENT AND CONSULTANTS CO.,LTD.
27 Rama 2 Road, Thakham, Bangkuntien,
Bangkok 10150 Thailand

Instrument : Sound Level Meter
Manufacturer : Rion
Model : NL-42
Serial No. : 00169544
Identity No. : N/A
Range : See to Data
Resolution : 0.1 dB
Calibration Method : CP-WK-A01

Ambient Temperature : $(23.0 \pm 2) ^\circ\text{C}$
Humidity : $(50.0 \pm 15) \% \text{RH}$
Received Date : 2-Mar-22
Calibrated Date : 7-Mar-22
Issued Date : 7-Mar-22
Calibrated Location : In Lab

Reference standard instruments :

<u>Instrument</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Level Calibrator	10049416	EEL.BP.120/0164	25-Jan-23	TISTR

TISTR : Thailand Institute of Scientific and Technological Research.

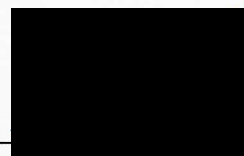
This result calibrate was found accurate as shown on date place of calibrate only

This certificate is traceability to the International System of Unit (SI)

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

Calibrated by : Mr. Chaiyo Obchoei

Approved by :



Ms. Budsagorn Patcha

Authorized Signatory

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Calibration Results

Certificate No. : WK2203-009-2

Page 2 of 2

Calibration Result of the Accuracy

Function : Sound Level Measurement at 1 kHz

Range : A Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.2	0.2	0.20
114	114.2	0.2	0.20

Range : A Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.2	0.2	0.20
114	114.2	0.2	0.20

Range : C Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.2	0.2	0.20
114	114.2	0.2	0.20

Range : C Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.2	0.2	0.20
114	114.2	0.2	0.20

(X) Without Adjustment () After Adjustment

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**** End of Certificate****



Certificate of Calibration

Certificate No.: WK2203-009-1

Page 1 of 2

Customer : PINTHONG GROUP MANAGEMENT AND CONSULTANTS CO.,LTD.
27 Rama 2 Road, Thakham, Bangkuntien,
Bangkok 10150 Thailand

Instrument : Sound Level Meter
Manufacturer : Rion
Model : NL-42
Serial No. : 00169549
Identity No. : N/A
Range : See to Data
Resolution : 0.1 dB
Calibration Method : CP-WK-A01

Ambient Temperature : $(23.0 \pm 2) ^\circ\text{C}$
Humidity : $(50.0 \pm 15) \% \text{RH}$
Received Date : 2-Mar-22
Calibrated Date : 7-Mar-22
Issued Date : 7-Mar-22
Calibrated Location : In Lab

Reference standard instruments :

<u>Instrument</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Level Calibrator	10049416	EEL.BP.120/0164	25-Jan-23	TISTR

TISTR : Thailand Institute of Scientific and Technological Research.

This result calibrate was found accurate as shown on date place of calibrate only

This certificate is traceability to the International System of Unit (SI)

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

Calibrated by : Mr. Chaiyo Obchoei

Approved by :



Ms. Budsagorn Patcha

Authorized Signatory

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Calibration Results

Certificate No. : WK2203-009-1

Page 2 of 2

Calibration Result of the Accuracy

Function : Sound Level Measurement at 1 kHz

Range : A Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.4	0.4	0.20
114	114.4	0.4	0.20

Range : A Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.4	0.4	0.20
114	114.4	0.4	0.20

Range : C Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.4	0.4	0.20
114	114.4	0.4	0.20

Range : C Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.4	0.4	0.20
114	114.4	0.4	0.20

(X) Without Adjustment () After Adjustment

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**** End of Certificate****



Certificate of Calibration

Certificate No.: WK2203-009-4

Page 1 of 2

Customer : PINTHONG GROUP MANAGEMENT AND CONSULTANTS CO.,LTD.
27 Rama 2 Road, Thakham, Bangkuntien,
Bangkok 10150 Thailand

Instrument : Sound Level Meter
Manufacturer : SoundPro
Model : N/A
Serial No. : BBG030004
Identity No. : N/A
Range : See to Data
Resolution : 0.1 dB
Calibration Method : CP-WK-A01

Ambient Temperature : $(23.0 \pm 2) ^\circ\text{C}$
Humidity : $(50.0 \pm 15) \% \text{RH}$
Received Date : 2-Mar-22
Calibrated Date : 7-Mar-22
Issued Date : 7-Mar-22
Calibrated Location : In Lab

Reference standard instruments :

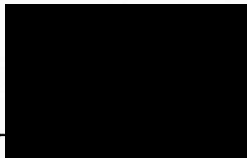
<u>Instrument</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Level Calibrator	10049416	EEL.BP.120/0164	25-Jan-23	TISTR

TISTR : Thailand Institute of Scientific and Technological Research.
This result calibrate was found accurate as shown on date place of calibrate only
This certificate is traceability to the International System of Unit (SI)

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

Calibrated by : Mr. Chaiyo Obchoei

Approved by :


Ms. Budsagorn Patcha
Authorized Signatory

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Calibration Results

Certificate No. : WK2203-009-4

Page 2 of 2

Calibration Result of the Accuracy

Function : Sound Level Measurement at 1 kHz

Range : A Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.1	0.1	0.20

Range : A Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	94.0	0.0	0.20
114	114.1	0.1	0.20

Range : C Mode : Fast Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	93.9	-0.1	0.20
114	113.9	-0.1	0.20

Range : C Mode : Slow Resolution : 0.1 dB

STD Setting	UUC Reading	Error	Uncertainty (± dB)
94	93.9	-0.1	0.20
114	113.9	-0.1	0.20

(X) Without Adjustment () After Adjustment

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**** End of Certificate****

Request No. 22-65 / 0364

MTC No. PSL-H 0180 / 65

Certificate of Calibration

Customer : Pinthong Group Management and Consultants Company Limited
27 Rama 2 Rd., Tha Kham, Bang Khun Thian, Bangkok 10150

Equipment : Thermo-Hygrometer (Thermal Environment Monitor)

Model /Type : QUESTemp°32

Serial Number : TPQ030029

Maker : 3M

Date of Request : 2 March 2022

Date of Calibration : 21 March 2022

This certificate is traceable to International System of Units (SI Units) through Photometry and Temperature Standards Laboratory, Industrial Metrology and Testing Service Centre, Thailand Institute of Scientific and Technology Research (TISTR), NSC-ONSC accredited Calibration No. 0015.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %.

Calibrated by :

Approved by :

(Ms. Panit Thummasri)

(Mr. Kamchai Singhapiwat)

Director

Photometry and Temperature Standards Laboratory

Ref. No : 2012265030200972002

Issued Date : 28 March 2022

Page 1 of 4

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FM.BL.MTC.002 Rev.4

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Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

Request No. 22-65 / 0364

MTC No. PSL-H 0180 / 65

Description of Unit Under Calibration :

Customer : Pinthong Group Management and Consultants Company Limited
Address : 27 Rama 2 Rd., Tha Kham, Bang Khun Thian, Bangkok 10150
Equipment : Thermo-Hygrometer (Thermal Environment Monitor)
Serial Number : TPQ030029
Calibration Required : Temperature at (30, 35, 40) °C
Ambient Condition : Ambient temperature (23 ± 3) °C
Relative humidity (55 ± 20) %
Laboratory Address : Photometry and Temperature Standards Laboratory
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Samutprakan

Reference Standard :

Digital Thermometer with Sensor, Model : F250H, S/N : 9345 008 2331, Sensor RTD Probe No. RTD-01 and RTD-02 which was calibrated by Industrial Metrology and Testing Service Centre, Certificate No. PSL-T 1081/64.

The temperature scale in use of this laboratory is the International Temperature Scale of 1990.

Calibration Procedure :

The certifies the above equipment was calibrated according to procedure no. WI.CP.18.

Support Equipment :

Temperature & Humidity Controlled Chamber, Model : 9145-5116-00AA, S/N : 1403041

Adjustments : NONE

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Request No. 22-65 / 0364

MTC No. PSL-H 0180 / 65

Results of Calibration :-

Table : Temperature Measurement @ Wet Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
30.1	29.9	0.2	0.50
35.1	35.0	0.1	0.50
40.0	39.9	0.1	0.50

Table : Temperature Measurement @ Dry Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
30.1	30.2	-0.1	0.50
35.1	35.2	-0.1	0.50
40.0	40.2	-0.2	0.50

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Request No. 22-65 / 0364

MTC No. PSL-H 0180 / 65

Results of Calibration :-

Table : Temperature Measurement @ Globe Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
30.1	30.0	0.1	0.50
35.1	35.0	0.1	0.50
40.0	39.9	0.1	0.50

- Note :**
1. This calibration was done without removing reservoir cover, white plates and blackened copper sphere of the instrument.
 2. The calibration data for instrument in this report is reported within the condition existing at the time of measurement only.

...end of certificate...

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Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

Request No. 22-65 / 0292

MTC No. PSL-H 0137 / 65

Certificate of Calibration

Customer : Pinthong Group Management and Consultants Company Limited
81/109 Moo 1, Rama 2 Rd., Tha Kham, Bang Khun Thian, Bangkok, 10150

Equipment : Thermo-Hygrometer (Thermal Environment Monitor)

Model /Type : QUESTemp°32

Serial Number : TPG030014

Maker : QUEST Technologies

Date of Request : 3 February 2022

Date of Calibration : 11 February 2022

This certificate is traceable to International System of Units (SI Units) through Photometry and Temperature Standards Laboratory, Industrial Metrology and Testing Service Centre, Thailand Institute of Scientific and Technology Research (TISTR), NSC-ONSC accredited Calibration No. 0015.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95 %.

Calibrated by :

(Ms. Panit Thummasri)

Approved by

(Mr. Kamchai Singhapiwat)

Director

Photometry and Temperature Standards Laboratory

Ref. No : 2012265020300475001

Issued Date : 23 February 2022

Page 1 of 4

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Request No. 22-65 / 0292

MTC No. PSL-H 0137 / 65

Description of Unit Under Calibration :

Customer : Pinthong Group Management and Consultants Company Limited
Address : 81/109 Moo 1, Rama 2 Rd., Tha Kham, Bang Khun Thian, Bangkok, 10150
Equipment : Thermo-Hygrometer (Thermal Environment Monitor)
Serial Number : TPG030014
Calibration Required : Temperature at (30, 35, 40) °C
Ambient Condition : Ambient temperature (23 ± 3) °C
Relative humidity (55 ± 20) %
Laboratory Address : Photometry and Temperature Standards Laboratory
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Samutprakan

Reference Standard :

Digital Thermometer with Sensor, Model : F250H, S/N : 9345 008 2331, Sensor RTD Probe No. RTD-01 and RTD-02 which was calibrated by Industrial Metrology and Testing Service Centre, Certificate No. PSL-T 1081/64.

The temperature scale in use of this laboratory is the International Temperature Scale of 1990.

Calibration Procedure :

The certifies the above equipment was calibrated according to procedure no. WI.CP.18.

Support Equipment :

Temperature & Humidity Controlled Chamber, Model : 9145-5116-00AA, S/N : 1403041

Adjustments : NONE

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Request No. 22-65 / 0292

MTC No. PSL-H 0137 / 65

Results of Calibration :-

Table : Temperature Measurement @ Wet Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
29.9	29.9	0.0	0.50
35.0	34.8	0.2	0.50
39.9	39.7	0.2	0.50

Table : Temperature Measurement @ Dry Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
29.9	30.0	-0.1	0.50
35.0	35.0	0.0	0.50
39.9	40.0	-0.1	0.50

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Request No. 22-65 / 0292

MTC No. PSL-H 0137 / 65

Results of Calibration :-

Table : Temperature Measurement @ Globe Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
29.9	29.8	0.1	0.50
35.0	34.7	0.3	0.50
39.9	39.6	0.3	0.50

- Note :**
1. This calibration was done without removing reservoir cover, white plates and blackened copper sphere of the instrument.
 2. The calibration data for instrument in this report is reported within the condition existing at the time of measurement only.

...end of certificate...

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