

ภาคผนวก ง

ใบแสดงการตรวจเทียบเครื่องมือ



## High Volume TSP & PM-10 Calibration Data Sheet

Calibration Location : SECOT Co.,Ltd. Calibration Date : Jan 14, 2022  
 Hi-Vol Pump No. : BH-008 Indicator No. : CM-01  
 Amb. Temp (°C) : 25 Press (mmHg) : 760  
 Calibration by : Mr.Punkawin K.

Plate	Indicate (X) ( cm. )	True H <sub>2</sub> O ( in. )	Actual Flow (Y) (cfm)	XY	X <sup>2</sup>	Remark
18	17.40	12.50	58.84	1,023.82	302.76	
13	14.40	10.10	53.20	766.08	207.36	
10	11.60	7.80	46.90	544.04	134.56	
7	7.60	5.10	38.17	290.09	57.76	
5	4.80	3.10	30.04	144.19	23.04	
Sum	55.80	38.60	227.15	2,768.22	725.48	

Calibrated by : Punkawin Approved by : Mr. Haya K.



## High Volume TSP & PM-10 Calibration Data Sheet

Calibration Location : SECOT Co.,Ltd. Calibration Date : Feb 3, 2022  
 Hi-Vol Pump No. : BH-014 Indicator No. : CM-01  
 Amb. Temp (°C) : 25 Press (mmHg) : 760  
 Calibration by : Mr.Punkawin K.

Plate	Indicate (X) ( cm. )	True H <sub>2</sub> O ( in. )	Actual Flow (Y) (cfm)	XY	X <sup>2</sup>	Remark
18	17.60	12.60	59.07	1,039.70	309.80	
13	14.00	10.20	53.45	748.30	196.00	
10	11.20	7.80	46.90	525.30	125.40	
7	7.20	5.20	38.50	277.40	51.80	
5	4.00	3.10	30.04	120.20	16.00	
Sum	54.00	38.90	227.96	2,710.90	699.00	

Calibrated by : Punkawin Approved by : Mr. Haya K.



## High Volume TSP & PM-10 Calibration Data Sheet

Calibration Location : SECOT Co.,Ltd. Calibration Date : Jan 13, 2022  
 Hi-Vol Pump No. : BH-018 Indicator No. : CM-01  
 Amb. Temp (°C) : 25 Press (mmHg) : 760  
 Calibration by : Mr.Punkawin K.

Plate	Indicate (X) ( cm. )	True H <sub>2</sub> O ( in. )	Actual Flow (Y) (cfm)	XY	X <sup>2</sup>	Remark
18	17.00	12.40	58.61	996.37	289.00	
13	14.00	10.20	53.45	748.30	196.00	
10	11.00	8.00	47.48	522.28	121.00	
7	7.20	5.20	38.53	277.42	51.84	
5	4.20	3.20	30.50	128.10	17.64	
Sum	53.40	39.00	228.57	2,672.47	675.48	

Calibrated by : Punkawin Approved by : Wittaya K.



## High Volume TSP & PM-10 Calibration Data Sheet

Calibration Location : SECOT Co.,Ltd. Calibration Date : Feb 3, 2022  
 Hi-Vol Pump No. : BH-030 Indicator No. : CM-01  
 Amb. Temp (°C) : 25 Press (mmHg) : 760  
 Calibration by : Mr.Punkawin K.

Plate	Indicate (X) ( cm. )	True H <sub>2</sub> O ( in. )	Actual Flow (Y) (cfm)	XY	X <sup>2</sup>	Remark
18	19.60	12.40	58.61	1,148.80	384.16	
13	16.20	10.20	53.45	865.90	262.40	
10	12.80	8.00	47.48	607.80	163.80	
7	8.20	5.20	38.53	316.00	67.20	
5	4.80	3.20	30.50	146.40	23.00	
Sum	61.60	39.00	228.57	3,084.90	900.56	

Calibrated by : Punkawin Approved by : Wittaya K.



ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

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Tel: +66 2709 4860-8 Fax: +66 2324 0917-8



Certificate No.: CP20210095EA  
Operation No.: CP2021120016

### Certificate of Calibration

Equipment: Sound Calibrator

Manufacturer: RION

Model/Type: NC-74

Serial No.: 34283648

ID No.:

Customer: SECOT Co.,Ltd.

Address: 239 Rimklongprapa Rd., Bangsue,  
Bangkok 10800 Thailand

Received Date: 21 December 2021

Calibrated Date: 24 December 2021

Issued Date: 28 December 2021

Calibrated by: Ms. Juntaporn Kunhakom

Approved by:

( Mr. Sittichai Swaksuriyawong )  
Group Manager

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Certificate No.: CP20210095EA

### Calibration Report

Equipment: Sound Calibrator  
Manufacturer: RION  
Model/Type: NC-74  
Serial No.: 34283648  
ID No.:  
Ambient Temperature:  $(23 \pm 2) ^\circ\text{C}$   
Relative Humidity:  $(50 \pm 15) \%$   
Pressure:  $(101.3 \pm 1.5) \text{ kPa}$

Method of Calibration :-

IEC 60942:2017

#### Condition of this result of calibration

##### 1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2661000	AA-1010-21	13 June 2022
2) Waveform Generator	33511B	MY52302264	0144RF21	17 June 2022
3) Audio Analyzing DMM	2015-P	4079144	E1U210398	2 February 2022
4) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P210047 0255TE21	16 June 2022 7 July 2022

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

3. This certification is traceable to the international system of unit maintained at :-

Reference standards instrument for Acoustic function

- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- Electrical and Electronics Institute; ONSC Accredited Calibration No.0119

#### Result of Calibration:-

##### 1. Function : Sound pressure level

Nominal Frequency (Hz)	Specified Sound Pressure level (dB)	Measured value (dB)	Deviated value <sup>[1]</sup> (dB)	Acceptance limit <sup>[3]</sup> (dB)
1000	94	94.22	0.22	$\pm 0.25$

##### 2. Function : Frequency

Nominal Sound Pressure level (dB)	Specified Frequency (Hz)	Measured value (Hz)	Deviated value <sup>[2]</sup> (%)	Acceptance limit <sup>[3]</sup> (%)
94	1000	1003.0	0.3	$\pm 0.7$



ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20210095EA

Calibration Report

3. Function : Total distortion + noise

Normalat	Normalat	Measured value <sup>[1]</sup>	Acceptance limit <sup>[2]</sup>
Sound Pressure level (dB)	Frequency (Hz)	(%)	(%)
94	1000	1.3	2.5

Uncertainty of measurement

Function	Uncertainty	Maximum-permitted uncertainty of measurement
Sound pressure level	0.10 dB	0.15 dB
Frequency	0.10 %	0.20 %
Total distortion + noise	0.40 %	0.50 %

Note: [1] The deviated value is the absolute value of the difference between the measured value and the corresponding specified sound pressure level.  
[2] The deviated value is the absolute value of the difference in percent between the measured value and the corresponding specified frequency.  
[3] The acceptance limit is for the deviated value.  
[4] The measured value is the total distortion + noise, measured over the frequency range from 20 Hz to 20 kHz.  
[5] The acceptance limit is for the Measured value.  
Remarks: 1. Using the 1/2-inch microphone adaptor NC-74-002.  
2. Acceptance limit was IEC 60942:2017 Class 1.

-- End of Report --



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Certificate No.: CP20210098EA

Operation No.: CP2021120019

Certificate of Calibration

Equipment: Sound Calibrator  
Manufacturer: Cirrus Research Plc  
Model/Type: CR:515  
Serial No.: 94296  
ID No.:  
Customer: SECOT Co.,Ltd.  
Address: 239 Rimklongprapa Rd., Bangsue,  
Bangkok 10800 Thailand  
Received Date: 21 December 2021  
Calibrated Date: 24 December 2021  
Issued Date: 28 December 2021  
Calibrated by: Ms. Juntaporn Kunhakorn

Approved by:   
( Mr. Sittichai Swaksuriyawong )  
Group Manager

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FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20210098EA

Calibration Report

Equipment: Sound Calibrator  
Manufacturer: Cirrus Research Plc  
Model/Type: CR-515  
Serial No.: 94296  
ID No.:  
Ambient Temperature:  $(23 \pm 2) ^\circ\text{C}$   
Relative Humidity:  $(50 \pm 15) \%$   
Pressure:  $(101.3 \pm 1.5) \text{ kPa}$   
Method of Calibration :-  
IEC 60942:2017

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2661000	AA-1010-21	13 June 2022
2) Waveform Generator	33511B	MY52302264	0144RF21	17 June 2022
3) Audio Analyzing DMM	2015-P	4079144	E1U210398	2 February 2022
4) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P210047 0255TE21	16 June 2022 7 July 2022

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

3. This certification is traceable to the international system of unit maintained at :-

- Reference standards instrument for Acoustic function
  - National Institute of Metrology (Thailand)
- Reference standards instrument for Electrical function
  - Electrical and Electronics Institute; ONSC Accredited Calibration No.0119

Result of Calibration:-

1. Function : Sound pressure level

Normal Frequency (Hz)	Specified Sound Pressure level (dB)	Measured value (dB)	Deviated value <sup>[1]</sup> (dB)	Acceptance limit <sup>[1]</sup> (dB)
1000	94	93.80	-0.20	$\pm 0.25$

2. Function : Frequency

Normal Sound Pressure level (dB)	Specified Frequency (Hz)	Measured value (Hz)	Deviated value <sup>[2]</sup> (%)	Acceptance limit <sup>[3]</sup> (%)
94	1000	1000.3	0.0	$\pm 0.7$



ELECTRICAL AND ELECTRONICS INSTITUTE  
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20210098EA

Calibration Report

3. Function : Total distortion + noise

Normal Sound Pressure level (dB)	Normal Frequency (Hz)	Measured value <sup>[4]</sup> (%)	Acceptance limit <sup>[5]</sup> (%)
94	1000	1.4	2.5

Uncertainty of measurement

Function	Uncertainty	Maximum-permitted uncertainty of measurement
Sound pressure level	0.10 dB	0.15 dB
Frequency	0.10 %	0.20 %
Total distortion + noise	0.40 %	0.50 %

- Note:
- [1] The deviated value is the absolute value of the difference between the measured value and the corresponding specified sound pressure level.
  - [2] The deviated value is the absolute value of the difference in percent between the measured value and the corresponding specified frequency.
  - [3] The acceptance limit is for the deviated value.
  - [4] The measured value is the total distortion + noise, measured over the frequency range from 20 Hz to 20 kHz.
  - [5] The acceptance limit is for the Measured value.

Remarks: 1. Acceptance limit was IEC 60942:2017 Class 1.

-- End of Report --

# CERTIFICATE OF CALIBRATION

ISSUED BY Noisemeters

DATE OF ISSUE 06/04/22 CERTIFICATE NUMBER 172690

Noisemeters

Noisemeters  
Acoustic House  
Bridlington Road  
Hunmanby  
YO14 0PH  
United Kingdom  
www.noisemeters.com

Page 1 of 1

Test engineer:  
Nigel Smith  
Electronically signed:

*Nigel Smith*

## doseBadge Reader

### Instrument

Manufacturer: Cirrus Research plc  
Model Number: RC:110A  
Serial Number: 95168  
Notes:

### Calibration Procedure

The tests were carried out in accordance with the requirements of IEC 60942:2003 where applicable.

Date of Calibration: 06 April 2022

### Functionality Results

Function	Result
Keypad	Pass
Battery Power	Pass
Display	Pass
Communication	Pass
2 way IR link	Pass
Clock	Pass

### Calibration Results

	Level (dB)	Frequency (Hz)	Distortion (% THD + Noise)
Initial	113.90	993.3	0.46
Adjusted	114.00	993.3	0.46
Uncertainty	± 0.11	± 0.14	± 0.10
Tolerances	± 0.60	± 2.00	± 4.00

### Environmental Conditions

Pressure: 98.30 kPa  
Temperature: 22.6 °C  
Humidity: 42.3 %

### Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.



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HSC-TIS-TIS 17025  
CALIBRATION 0119

Certificate No.: CC202200645A

Operation No.: CC202200011

## Certificate of Calibration

Equipment: Thermal Environment Monitor

Manufacturer: 3M

Model/Type: QUESTemp® 46

Serial No.: TSQ090004

ID No.: -

Customer: Secot Co., Ltd.

Address: 239 Rimklongprapa RD., Bangsue,  
Bangkok 10800 Thailand

Received Date: 15 February 2022

Calibrated Date: 24 February 2022

Issued Date: 28 February 2022

Calibrated by: Ms. Sutida Phakdeewut

Approved by:

*K. Paksan*  
(Mr. Komsan Pakdeewut)  
Group Manager

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The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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F-CAL-004 Ed.1



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Certificate No.: CC20220064EA

Calibration Report

Equipment: Thermal Environment Monitor  
Manufacturer: 3M  
Model/Type: QUESTemp® 46  
Serial No.: TSQ090004  
ID No.:

Ambient Temperature:  $(23 \pm 3) ^\circ\text{C}$   
Relative Humidity:  $(45 \pm 15) \%$

Method of Calibration :-

In-house method : CC-TE010 by comparison with PRT and chilled mirror hygrometer in controlled chamber.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Dew Master Hygrometer	Optidew 401	171926	TH-0110-21	10 November 2022
2) SPRT Module	2560	A6A956	0295EL21	27 May 2022
3) Secondary SPRT Probe	5628	1354	CD20210066EA	16 November 2022

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

3. This certification is traceable to the international system of unit maintained at :-

Reference standard instrument for function humidity

- National Institute of Metrology (Thailand); ONSC Accredited Calibration No.0144

Reference standard instrument for function temperature

- Electrical and Electronics Institute; ONSC Accredited Calibration No.0119

Results of Calibration:-

Function : Humidity Measurement

Applied Condition			Thermal Environment Monitor		
Average Measured Temperature ( $^\circ\text{C}$ )	Average Measured Dew-Point Temperature ( $^\circ\text{C}$ )	Calculated Relative Humidity (%RH)	Average Displayed Temperature ( $^\circ\text{C}$ )	Average Displayed Relative Humidity (%RH)	Expanded Uncertainty ( $\pm\%$ RH)
15.0076	4.74	50.28	15.2	52.1	1.2
24.9761	13.74	49.70	25.2	49.8	1.2
34.9035	22.83	49.68	35.2	48.3	1.2

Function : Temperature Measurement @ 50 %RH

Standard Reading ( $^\circ\text{C}$ )	UUC Reading ( $^\circ\text{C}$ )			Expanded Uncertainty ( $\pm^\circ\text{C}$ )
	Wet Bulb	Dry Bulb	Globe Bulb	
15.0076	10.8	15.2	15.2	0.50
24.9761	18.6	25.2	25.2	0.50
34.9035	26.6	35.2	35.1	0.50

Remark: 1. UUC : Unit Under Calibration

2. The coverage factor  $k = 2.00$

-- End of Report --



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Certificate No.: CC20220063EA

Operation No.: CC2022020010

Certificate of Calibration

Equipment: Thermal Environment Monitor

Manufacturer: 3M

Model/Type: QUESTemp® 46

Serial No.: TSM050002

ID No.:

Customer: Secot Co.,Ltd.

Address: 239 Rimklongprapa RD.,Bangsue,  
Bangkok 10800 Thailand

Received Date: 15 February 2022

Calibrated Date: 24 February 2022

Issued Date: 28 February 2022

Calibrated by: Ms. Sutida Phakdeewut

Approved by:

*K. Pattana*  
( Mr. Komsan Pakdeewut )  
Group Manager

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FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CC20220063EA

Calibration Report

Equipment: Thermal Environment Monitor  
Manufacturer: 3M  
Model/Type: QUESTemp° 46  
Serial No.: TSM050002  
ID No.: -

Ambient Temperature:  $(23 \pm 3) ^\circ\text{C}$   
Relative Humidity:  $(45 \pm 15) \%$

Method of Calibration :-

In-house method : CC-TE010 by comparison with PRT and chilled mirror hygrometer in controlled chamber.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Dew Master Hygrometer	Optidew 401	171926	TH-0110-21	10 November 2022
2) SPRT Module	2560	A6A956	0295EL21	27 May 2022
3) Secondary SPRT Probe	5628	1354	CD20210066EA	16 November 2022

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

3. This certification is traceable to the international system of unit maintained at :-

Reference standard instrument for function humidity

- National Institute of Metrology (Thailand); ONSC Accredited Calibration No.0144

Reference standard instrument for function temperature

- Electrical and Electronics Institute; ONSC Accredited Calibration No.0119

Results of Calibration:-

Function : Humidity Measurement

Applied Condition			Thermal Environment Monitor		
Average Measured Temperature $(^\circ\text{C})$	Average Measured Dew-Point Temperature $(^\circ\text{C})$	Calculated Relative Humidity $(\%RH)$	Average Displayed Temperature $(^\circ\text{C})$	Average Displayed Relative Humidity $(\%RH)$	Expanded Uncertainty $(\pm\%RH)$
15.0076	4.74	50.28	15.0	54.2	1.2
24.9761	13.74	49.70	25.0	52.4	1.2
34.9035	22.83	49.68	35.0	51.0	1.2

Function : Temperature Measurement @ 50 %RH

Standard Reading $(^\circ\text{C})$	UUC Reading $(^\circ\text{C})$			Expanded Uncertainty $(\pm^\circ\text{C})$
	Wet Bulb	Dry Bulb	Globe Bulb	
15.0076	10.8	15.0	15.1	0.50
24.9761	18.8	25.0	25.0	0.50
34.9035	27.0	35.0	34.7	0.50

Remark: 1. UUC : Unit Under Calibration

2. The coverage factor  $k = 2.00$

-- End of Report --



INTERNATIONAL TESTING SERVICE CO., LTD

1213/388 Ladprao Rd. Ladprao Rd. Wangtonglang Bangkok 10310

Tel 0-2559-2095 Fax 0-2559-2096

E-mail : sale@itest-lab.com web site : www.itest-lab.com

CALIBRATION CERTIFICATE

Order No. : O-2202-013

Customer : SECOT CO., LTD (HEAD OFFICE)  
Address : 239 rimklongprapa Rd., Bangsue, Bangkok 10800

Description of Equipment : Thermal Environment Monitor  
Manufacturer : 3M  
Model Number : QUESTemp° 46  
Serial Number : TSR010002  
ID./Control No. : N/A  
Made In : USA  
Location : In House  
Environment Conditions : Temperature  $(23 \pm 3) ^\circ\text{C}$   
Humidity  $(50 \pm 20) \%RH$   
Cal Date : FEB 18, 2022  
Issue Date : FEB 18, 2022

Uncertainty of Measurement

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of  $k=2$ . It has been evaluated according to the "Expression of the Uncertainty of measurement in Calibration (EA-4/02)" which provides a level of confidence approximately 95%.

Calibration result approved by

Approved on behalf of  
International Testing Service Co., Ltd

*T. Jitman*  
(Mr. Uttana Tholueang)

Technical laboratory



*P. Vivat-Anant*  
(Mr. Pichit Vivat-Anant)

Managing Director

The Results shown in this certification report refer only to the equipment(s) calibrated unless otherwise stated  
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Tel 0-2559-2095 Fax 0-2559-2096E-mail : sale@itest-lab.com web site : [www.itest-lab.com](http://www.itest-lab.com)**Certificate of Calibration :**

Description : Thermal Environment Monitor Serial No. : TSR010002 Order No. : O-2202-013  
Manufacturer : 3M ID./control No. : N/A Received Date : FEB 15, 2022  
Model : QUESTemp° 46 Made In : USA Calibration Date: FEB 18, 2022

**Calibration method :**

- This instrument was calibrated by comparison with standard chilled mirror hygrometer follow to in house calibration method
- Into humidity and temperature chamber the temperature scale used was based on ITS-90
- This result was found accurate as shown on date and place of calibration only.

**Reference Standard :**

Description	Model	Serial No.	Certificate No.	Due Date
Chilled Mirror Hygrometer, Edgetech	Dew Master	52542	TH-0123-21	NOV 26, 2022
Temperature & Humidity Chamber	PGC, 7041-5110	1708182	-	-

**Traceability :**

This Certification is traceable to the international system of unit maintained at:-  
- NIMT, National Institute of Metrology (Thailand).

**Result of Calibration :** Without adjustment

Calibration Range : 20 to 50 °C Resolution: 0.1 °C

**Function : Temperature Accuracy Test ( DRY )**

Test point ( °C )	Standard Reading ( °C )	UUC* Reading ( °C )	Correction ( °C )	Uncertainty of Measurement ( +/- °C )
20	20.02	20.1	-0.08	0.32
30	30.03	30.1	-0.07	0.32
40	40.04	40.2	-0.16	0.32
50	49.97	50.2	-0.23	0.32

**Result of Calibration :** Without adjustment

Calibration Range: 20 to 50 °C Resolution: 0.1 °C

**Function : Temperature Accuracy Test ( WET )**

Test point ( °C )	Standard Reading ( °C )	UUC* Reading ( °C )	Correction ( °C )	Uncertainty of Measurement ( +/- °C )
20	20.02	20.2	-0.18	0.32
30	30.03	30.2	-0.17	0.32
40	40.04	40.2	-0.16	0.32
50	49.97	50.2	-0.23	0.32

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Tel 0-2559-2095 Fax 0-2559-2096E-mail : sale@itest-lab.com web site : [www.itest-lab.com](http://www.itest-lab.com)**Certificate of Calibration :**

Description : Thermal Environment Monitor Serial No. : TSR010002 Order No. : O-2202-013  
Manufacturer : 3M ID./control No. : N/A Received Date : FEB 15, 2022  
Model : QUESTemp° 46 Made In : USA Calibration Date: FEB 18, 2022

**Result of Calibration :** Without adjustment

Calibration Range 20 to 50 °C Resolution: 0.1 °C

**Function : Temperature Accuracy Test ( GLOBE )**

Test point ( °C )	Standard Reading ( °C )	UUC* Reading ( °C )	Correction ( °C )	Uncertainty of Measurement ( +/- °C )
20	20.02	20.3	-0.28	0.32
30	30.03	30.3	-0.27	0.32
40	40.04	40.4	-0.36	0.32
50	49.97	50.3	-0.33	0.32

**Result of Calibration :** Without adjustment

Calibration Range: 30 to 70 % RH Resolution: 0.1 % RH

**Function : Humidity Accuracy Test**

Reference Temperature °C	Test point %RH	Standard Value %RH	UUC* Reading %RH	Correction %RH	Uncertainty of Measurement ( +/- %RH )
25.01	30	30.01	31.8	-1.79	1.2
24.98	50	49.93	51.5	-1.57	1.4
25.03	70	69.94	70.6	0.66	1.4

UUC\* = Unit Under Calibration

\*\*\*\*\*End Certificate of Calibration\*\*\*\*\*

The Results shown in this certification report refer only to the equipment(s) calibrated unless otherwise stated  
This Calibration Certificate cannot be reproduced, except in full, without permission of company.



## Heat Stress Meter Calibration

Date: Mar 31, 21

Temperature (°C) 20

Barometric Pressure: Pb (mmHg) 760

## REFERENCE STANDARD INSTRUMENT

Equipment : Dry Well

Model No. 9140 HDRC

Serial No. AOA890

Manufacturer HART SCIENTIFIC

Calibration Date 25 May 2020

## UNIT UNDER TEST

Equipment : Heat Stress Meter

Model No. HS-32

Serial No. MCC100029

Manufacturer METRO SONIC

## Temperature Reading

Reference Setting (°C)	Tg (°C)	T (°C)	Tn (°C)
20.0	20.2	20.1	20.1
25.0	25.1	25.2	25.2
30.0	30.1	30.0	29.9
35.0	35.1	34.9	34.9
40.0	40.0	39.8	39.8
45.0	45.1	44.9	44.8
50.0	49.8	49.8	49.7

- Note : 1) Tg = Globe thermometer temperature  
 2) Tn = Wet bulb with natural ventilation temperature  
 3) T = Ambient temperature

Calibrated by : Suraphong P.

Approved by : Wilaya K.



## Heat Stress Meter Calibration

Date: Mar 29, 21

Temperature (°C) 20

Barometric Pressure: Pb (mmHg) 760

## REFERENCE STANDARD INSTRUMENT

Equipment : Dry Well

Model No. 9140 HDRC

Serial No. AOA890

Manufacturer HART SCIENTIFIC

Calibration Date 25 May 2020

## UNIT UNDER TEST

Equipment : Heat Stress Meter

Model No. QUESTEMP 34

Serial No. TEH060119

Manufacturer QUEST

## Temperature Reading

Reference Setting (°C)	Tg (°C)	T (°C)	Tn (°C)
20.0	20.2	20.2	20.2
25.0	25.2	25.2	25.1
30.0	30.1	30.2	30.0
35.0	35.2	35.2	35.0
40.0	40.2	40.3	40.1
45.0	45.3	45.2	45.1
50.0	50.3	50.2	50.2

- Note : 1) Tg = Globe thermometer temperature  
 2) Tn = Wet bulb with natural ventilation temperature  
 3) T = Ambient temperature

Calibrated by : Suraphong P.

Approved by : Wilaya K.



## Heat Stress Meter Calibration

Date: Mar 30,21

Temperature (°C) 20

Barometric Pressure: Pb (mmHg) 760

## REFERENCE STANDARD INSTRUMENT

Equipment : Dry Well

Model No. 9140 HDRC

Serial No. AOA890

Manufacturer HART SCIENTIFIC

Calibration Date 25 May 2020

## UNIT UNDER TEST

Equipment : Heat Stress Meter

Model No. QUESTEMP °34

Serial No. TEL070017

Manufacturer QUEST

## Temperature Reading

Reference Setting (°C)	T <sub>g</sub> (°C)	T (°C)	T <sub>n</sub> (°C)
20.0	20.1	20.1	20.1
25.0	25.1	25.1	25.2
30.0	30.0	30.2	30.1
35.0	35.0	35.2	35.2
40.0	40.1	40.1	40.2
45.0	45.2	45.2	45.0
50.0	50.2	50.2	49.9

- Note : 1) T<sub>g</sub> = Globe thermometer temperature  
 2) T<sub>n</sub> = Wet bulb with natural ventilation temperature  
 3) T = Ambient temperature

Calibrated by : Suraphong P.Approved by : Witthaya L.

## Heat Stress Meter Calibration

Date: Apr 1,21

Temperature (°C) 20

Barometric Pressure: Pb (mmHg) 760

## REFERENCE STANDARD INSTRUMENT

Equipment : DIGITAL THERMOCOUPLE CALIBRATOR

Model No. 714

Serial No. 7590122

Manufacturer FLUKE

Calibration Date 15 July 2020

## UNIT UNDER TEST

Equipment : Heat Stress Meter

Model No. MICROTHERM

Serial No. 047890

Manufacturer Casella

## Temperature Reading

Reference Setting (°C)	T <sub>g</sub> (°C)	T (°C)	T <sub>n</sub> (°C)
30.0	29.8	30.0	30.0
40.0	39.8	39.9	40.0
50.0	49.9	49.9	49.9
60.0	59.9	60.0	59.8

- Note : 1) T<sub>g</sub> = Globe thermometer temperature  
 2) T<sub>n</sub> = Wet bulb with natural ventilation temperature  
 3) T = Ambient temperature

Calibrated by : Suraphong P.Approved by : Witthaya L.



# Heat Stress Meter Calibration

Date: Jan 12, 21

Temperature (°C) 25

Barometric Pressure: Pb (mmHg) 760

## REFERENCE STANDARD INSTRUMENT

## UNIT UNDER TEST

Equipment : DIGITAL THERMOCOUPLE CALIBRATOR Equipment : Heat Stress Meter

Model No. 714

Model No. MICROTHERM

Serial No. 7590122

Serial No. 0462505

Manufacturer FLUKE

Manufacturer Casella

Calibration Date 15 July 2020

## Temperature Reading

Reference Setting ( °C)	Tg ( °C)	T ( °C)	Tn ( °C)
30.0	29.9	29.9	29.9
40.0	39.9	40.0	39.9
50.0	49.8	49.8	49.9
60.0	59.8	59.9	59.9

- Note : 1) Tg = Globe thermometer temperature  
2) Tn = Wet bulb with natural ventilation temperature  
3) T = Ambient temperature

Calibrated by : Suraphong P.

Approved by : Wilaya K.



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250  
TEL. 0-2717-3000x24 FAX. 0-2719-9484



## Certificate of Calibration

Certificate No. : 20T1520

Page : 1 of 2

Equipment : Digital Thermometer With Sensor

Manufacturer: Fluke

Model : 714

Serial No.: 7590122

ID No.: 200209-1

Condition As-Received: Used Item

Received Date: 24 June 2020

Calibration Date: 13 July 2020  
to 15 July 2020

Reference: 2006-09450N

Ambient Temperature: ( 25 ± 3 ) °C

Relative Humidity: ( 50 ± 20 ) %

Submitted by: Secot Co., Ltd.

239 Rimklongprapa Road, Bangsue, Bangkok 10800

Procedure used: Calibration were conducted using in-house calibration procedure CP-T01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into liquid bath temperature controller. The temperature scale used was based on ITS-90.

## Condition of this result of calibration

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Digital Thermometer	1529	A7A609	1911235	24 Sep 2020
2) Industrial Platinum Resistance Thermometer	5627-12	571975	1911235	24 Sep 2020
3) Industrial Platinum Resistance Thermometer	5627-12	571970	1911235	24 Sep 2020
4) Industrial Platinum Resistance Thermometer	5627-12	555541	1911235	24 Sep 2020
5) Digital Thermometer	1529	A66176	1911397	01 Nov 2020
6) Industrial Platinum Resistance Thermometer	5627	739437	1911397	01 Nov 2020

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by : Yossapon Pojorn  
Issue Date : 20 July 2020

Approved Signatory :

- [ ] Phaihee Prabpaipai  
[ ] Chatchawan Khunpluek  
[x] Wanlop Larprum



Cert. No.: 20T1520  
Page.: 2 of 2

**Result of Calibration:-**

Without Adjustment

Function: Temperature measurement

This equipment was connected with Thermocouple Type K ID No. 200209-1

Immersion Depth ( mm. )	Standard Temperature ( °C )	UUC* Reading ( °C )	Error ( °C )	Uncertainty of Measurement ( ±°C )
150	-0.0007	0.7	0.7007	0.38
150	20.0056	20.1	0.0944	0.39
150	80.0019	79.0	-1.0019	0.43
150	104.0042	103.1	-0.9042	0.50
150	110.0051	108.9	-1.1051	0.52
150	150.0041	149.8	-0.2041	0.63
150	180.0045	180.2	0.1955	0.72

UUC\* : Unit Under Calibration

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

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TEL: 0-2717-3000-24 FAX: 0-2715-9114



**Certificate of Calibration**

Certificate No.: 201591  
Page: 1 of 4

Equipment: Dry Well Calibrator

Manufacturer: Hart Scientific

Model: 9140 HDRC

Serial No.: A0A890

ID No.: 200210

Condition As-Received: Used Item

Received Date: 13 May 2020

Calibration Date: 25 May 2020

to 28 May 2020

Reference: 2005-0314DN

Submitted by: Secot Co., Ltd.

Ambient Temperature: ( 25 ± 3 ) °C

Relative Humidity: ( 50 ± 20 ) %

239 Rimklongprapa Road., Bangsue, Bangkok 10800

Procedure used: Calibration were conducted using in-house calibration procedure CP-T15. The Standard Platinum Resistance Thermometer (SPRT) was calibrated by using the fixed points, sub-range 234.3156 K to 302.9146 K and 273.16 K to 692.877 K, as defined in the International Temperature Scale of 1990 (ITS-90). The measurement was made using precision resistance measuring Instrument with continuous measuring current of 1.0 mA and 1.414 mA.

**Condition of this result of calibration**

1. Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Digital Thermometer	1529	A91943	1911064	26 Aug 2020
2) Platinum Resistance Thermometer	5609	01158	1911064	26 Aug 2020
3) Platinum Resistance Thermometer	5615	875601	1911064	26 Aug 2020

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

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

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Suriya Tarapan

Issue Date: 29 May 2020

Approved Signatory:

[ ] Phalinee Prabpalpal  
[x] Chatchawan Khunpluek  
[ ] Wanlop Larprum

B 0230650



Cert. No.: 201591  
Page.: 2 of 4

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

**1. Temperature Generating Accuracy Test**

UUC* Setting °C	UUC* Reading °C	Standard reading °C	Error °C	Uncertainty ± °C
35.0	35.0	35.0289	-0.0289	0.50
50.0	50.0	50.0705	-0.0705	0.49
100.0	100.0	100.1831	-0.1831	0.52
250.0	250.0	250.2494	-0.2494	0.62
300.0	300.0	300.2842	-0.2842	0.66

UUC\*: Unit Under Calibration

- Note:**
- 1) The Report measured of the Standard reading is an average value of reading over 30 minute period after the verified temperature has reached equilibrium, and one-half of the maximum range of readings was determined as an instability with time.
  - 2) The Calibration was performed in a measurement zone of 40 mm. from the bottom of the test boring of the test temperature block.
  - 3) The Uncertainty quoted value is for the measured value of the actual temperature at the setting temperature of the test temperature block calibrator at the time of calibration. The contribution uncertainties from temperature distribution in the block are included in the uncertainty of measurement.



Cert. No.: 201591  
Page.: 3 of 4

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

**2. Temperature Distribution Performance Test**

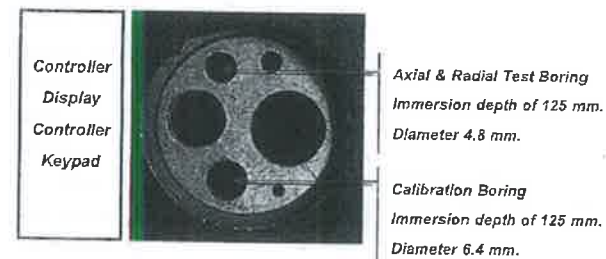
**2.1 Stability with time; 30 minutes period**

Temperature °C	Stability ± °C
Min. Range: 35	0.0127
Mid. Range: 100	0.0152
Max. Range: 300	0.0228

**2.2 Temperature Homogeneity in a measurement zone of 40 mm. (from the lower end of boring)**

Temperature °C	Axial Homogeneity °C	Radial Homogeneity °C
Min. Range: 35	0.0452	0.0210
Max. Range: 300	0.3488	0.1252

UUC\*



**Top View**

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







## Measurement Report

Request Service No. 098/65

Page 2 of 3

Description: Brand : Mettler Toledo Type : Top-Loading Electronic Balance

Model : AG245                      Serial No. : 1117293916 (198129-0)

Calibration range : 0 – 200 g                      Scale division : 0.00001 g (41g) / 0.0001 g (210g)

Calibration date : May 26,2022

Ambient Condition : Temperature 24.28–24.42 °C Relative humidity 48.10–50.90 %RH

Measurement data :

### 1. Repeatability of Reading :

Load (g)	Standard Deviation of Reading (g)	Maximum Difference between Successive Reading (g)
50	0.000047	0.0002
100	0.000067	0.0002
150	0.000048	0.0001
200	0.000052	0.0001

## 2. Off-Center Loading :

A Mass of 50.0000 g was placed and moved to various position on the pan.

Unit : g

Center	Front	Left	Back	Right	Center	Maximum Difference
50.00020	50.00046	50.00030	50.00000	50.00010	50.00020	0.00026

Issued Date : May 27, 2022

Request Service No.098/65

Page 3 of 3

### 3. Departure from Nominal Value :

Reading (g)	Correction (g)	Uncertainty (+/- g)
0	0.000000	$\pm 0.000008$
0.5	0.000005	$\pm 0.000014$
1	-0.000014	$\pm 0.000018$
10	-0.000071	$\pm 0.000034$
20	-0.000091	$\pm 0.000047$
40	-0.000151	$\pm 0.000074$
60	-0.00030	$\pm 0.00012$
80	-0.00021	$\pm 0.00014$
100	-0.00038	$\pm 0.00016$
120	-0.00041	$\pm 0.00018$
140	-0.00048	$\pm 0.00021$
160	-0.00050	$\pm 0.00023$
180	-0.00067	$\pm 0.00025$
200	-0.00124	$\pm 0.00027$

Calibrated by : Sasipa Jardee Approved By : [Signature]

(Miss Sasipa Jaidee)

(Miss Siripa Jhannong)

Testing Officer

Chief of Technical Management

Date : 26/05/2022

Date: 26/05/2022

Issued Date : May.27, 2022



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Website: www.bangkokhighlab.com E-mail: info@bangkokhighlab.com



NIST-TS-17025  
CALIBRATION 0366

## CERTIFICATE OF CALIBRATION

Certificate No : S2021/168

Page : 1/6

Order No : 399/2021

Customer : SECOT COMPANY LIMITED  
Address : 239 Rimklongprapa Rd., Bangsue, Bangkok 10800  
Instrument : UV/VIS spectrophotometer  
Manufacture : Thermo Scientific  
Model : GENESYS 10S UV-Vis  
Serial Number : 2L9N349007  
Environment : Temperature (25.2 - 24.8) °C  
Humidity (57 - 57) %RH  
Received Date : October 28, 2021  
Calibration Date : October 28, 2021  
Issued Date : November 5, 2021  
Calibrate Status : No Adjustment  
Calibration Area : Customer area  
Roomname : Laboratory Room of SECOT COMPANY LIMITED  
Calibrated By : Kittipong  
( Mr. Kittipong Yungsanit )  
Calibration Engineer  
Approved By : [Signature]  
( Mr. Wanchai Meesiri )  
Manager



Bangkok High Lab Co., Ltd.  
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Website: www.bangkokhighlab.com E-mail: info@bangkokhighlab.com



NIST-TS-17025  
CALIBRATION 0366

Certificate No : S2021/168

Page : 2/5

Order No : 399/2021

### 1. Photometric Accuracy

CRMs: Neutral Density Glass Filters

CRMs Serial Number: A404

Traceability: Traceable to NIST, U.S.A. through Neutral density filters NIST SRM 930a & 1930, Double Aperture method through Sarna certificate report 108644

Spectral slit width : 1.80 nm

1.1 Reading scale at 420.0 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4965	0.497	-0.0005	0.0044
0.9630	0.965	-0.0020	0.0033
2.0356	2.037	-0.0013	0.0064

1.2 Reading scale at 440.0 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4870	0.487	-0.0001	0.0040
0.9433	0.944	-0.0007	0.0040
1.9665	1.970	-0.0038	0.0064

1.3 Reading scale at 465.0 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4535	0.455	-0.0015	0.0034
0.8780	0.880	-0.0020	0.0040
1.8424	1.845	-0.0022	0.0060



Certificate No : S2021/168  
Page : 3/6  
Order No : 399/2021

#### 1.4 Reading scale at 546.1 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4706	0.471	-0.0004	0.0028
0.9094	0.911	-0.0016	0.0028
1.8755	1.877	-0.0016	0.0062

#### 1.5 Reading scale at 590.0 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4887	0.490	-0.0013	0.0029
0.9464	0.946	0.0004	0.0029
1.9021	1.903	-0.0012	0.0061

#### 1.6 Reading scale at 635.0 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4634	0.464	-0.0006	0.0030
0.8992	0.900	-0.0007	0.0030
1.7824	1.784	-0.0016	0.0062



Certificate No : S2021/168  
Page : 4/6  
Order No : 399/2021

## 2. Photometric Accuracy

CRMs: Potassium Dichromate in Perchloric acid

CRMs Serial Number: 15086

Blank Serial Number: 15178

Traceability: Traceable to NIST, U.S.A. through crystalline potassium dichromate NIST SRM 935a through Starna certificate report 88921

Spectral slit width : 1.80 nm

Wavelength (nm)	Certificate (Abs)	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
235	0.0000	0.000	0.0000	0.0050
	0.7340	0.732	0.0020	0.0056
257	0.0000	0.000	0.0000	0.0050
	0.8528	0.855	-0.0022	0.0055
313	0.0000	0.000	0.0000	0.0050
	0.2873	0.289	-0.0017	0.0054
350	0.0000	0.000	0.0000	0.0050
	0.6336	0.632	0.0016	0.0056

## 3. Wavelength Accuracy

Spectral slit width : 1.80 nm

3.1 CRMs: Holmium Glass Filter

CRMs Serial Number: W184/H

Traceability: Traceable to NIST Holmium oxide filter NIST SRM 2034, through Starna certificate report 108651

Filter STDs (nm) Certificate	Average Measured Value (nm)	Correction (nm)	Uncertainty ± (nm)
241.74	241.2	0.54	0.12
279.44	279.2	0.24	0.12
287.98	287.8	0.18	0.12
334.10	334.4	-0.30	0.12
361.00	360.8	0.20	0.12
418.61	418.8	-0.19	0.12
453.63	453.8	-0.17	0.12
460.05	460.2	-0.15	0.12
536.66	536.6	0.06	0.12
637.98	637.4	0.58	0.12



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Certificate No : S2021/168  
Page : 6/6  
Order No : 399/2021

### 3.2 CRMs: Didymium Glass Filter

CRMs Serial Number: W184/D

Traceability: Traceable to NIST Didymium filter NIST SRM 2034, through Starna certificate report 108652

Filter STDs (nm) Certificate	Average Measured Value (nm)	Correction (nm)	Uncertainty ± (nm)
585.29	585.4	-0.11	0.12
684.49	684.2	0.29	0.12
740.18	740.0	0.18	0.12
748.48	748.8	-0.32	0.12
807.03	807.6	-0.57	0.12
879.27	879.6	-0.33	0.12

### 4. \*Stray Light

CRMs: Potassium Chloride aqueous solution

CRMs Serial Number: 5469

Blank Serial Number: 8745

Traceability: Traceable to NIST, U.S.A. crystalline potassium chloride NIST SRM2032, through Starna certificate report 88922

Spectral slit width : 1.80 nm

Wavelength (nm)	Certificate	Average Measured
201.28	>2A	2.081
201.28	<1%T	0.9



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Certificate No : S2021/168  
Page : 6/6  
Order No : 399/2021

### 5. \*Spectral Resolution

CRMs: Toluene in Hexane

CRMs Serial Number: 8697

Blank Serial Number: 8716

Traceability: Traceable to toluene in hexane NIST SRM2034, through Starna certificate report 88923

Spectral slit width (nm)	Abs Ratio
0.5	#N/A
1.0	#N/A
1.5	#N/A
2.0	#N/A
3.0	#N/A

Note : \* "Not TISI Accredited" in this certificate have been included for completeness

### Remark:

- Calibrate Method
  - 1.1 Photometric accuracy: In-house method W-SER-001 based on ASTM E925-02 and ASTM E275-01
  - 1.2 Wavelength accuracy: In-house method W-SER-001 based on ASTM E925-02 and ASTM E275-01
  - 1.3 Stray light: Measuring the CRMs in both absorbance and transmittance unit at wavelength 201.23 nm. Base on European Pharmacopoeia V.6.19.3 1984
  - 1.4 Spectral resolution: Measuring the CRMs. The maximum absorbance values were read at closest to 268.7nm and the minimum absorbance values were read at closest 267.0 nm. Refer to European Pharmacopoeia V.6.19.3 1984
- N/A = not available.
- Uncertainty of Measurement: The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%.
- This result of calibration was found accurate as shown on date and place of calibration only.
- This report will certify of calibrated equipment only.

- End of Report -

# Calibration Certificate

**Certificate No.:** 2104065-001-01  
**Client name:** SECOT CO., LTD.  
**Address:** 239 Rimklongprapa Road,  
 Bangsue, Bangsue, Bangkok 10800

Page 1 of 3

**Equipment:** CHAMBER (Hot Air Oven)

**Manufacturer:** **BINDER**

Model: ED 53

Serial No.: 01-27152

ID No.: N/A

Order No.: 2104065

**Operation No.:** 2104065-001

Date of Receipt: 2 August 2021

Date of Calibration: 2 August 2021

**Calibrated by** Mr. Worapob Sooktong  
Scientist

**Approved by**

( Mr.Pheraphat Tuanjit )

**Manager, Division of Calibration Laboratory**

Date of Issue: 3 August 2021

**Responsible for the Technical Management Team**

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

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

## Calibration Report

**Certificate No.:** Z104065-001-01

**Equipment:** CHAMBER (Hot Air Oven)

**Model:** ED 53      **Serial No.:** 01-27152

**Resolution:** 1 °C      **ID No.:** N/A

**Manufacturer:** BINDER

Date of Calibration: 2 August 2021

Page 2 of 3

**Location:** Laboratory, SECOT CO., LTD.

**Environment Condition:**

Ambient Temperature	( 29 ± 1 ) °C
Relative Humidity	( 59 ± 4 ) %
Line Voltage	( 230 ± 0 ) Volt

**Condition of this results of Calibration:**

1. This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-C14 Based on TLAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
- The temperature scale used was based on ITS - 90.
  - All data show below were final values and the initial data may be obtained upon request.

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY49016894	TE 640400-01	24 April 2022	NATIONAL FOOD INSTITUTE
	RTD	CH#101-105/ RTD# 101-109			

3. This certificate is traceable to International System of Units (SI Units).
4. This certificate was certified only for the instrument we calibrated.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of Calibrated item :      Good

UUC Description :

Time of Record 1 Hour 9 Minute At 104, 110 and 180 °C

Fresh air Damper

☐☒

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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Close

Not Available

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



National Food Institute, Ministry of Industry, Thailand

1005, 3rd Fl., Wichitwankong Road, Bangkok, Thailand 10330, Bangkok, Thailand  
Tel: +66 (0) 2 622 1111 Fax: +66 (0) 2 622 1112 Email: nfi@nfi.go.th



## Calibration Report

**Certificate No.:** 2104065-001-01  
**Equipment:** CHAMBER (Hot Air Oven)  
Model: ED 53 Serial No.: 01-27152  
Resolution: 1 °C ID No.: N/A  
Manufacturer: BINDER

**Date of Calibration:** 2 August 2021

Page 3 of 3

**Calibration point:** 104, 110 and 180 °C

**Calibration result:**

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
MIN	29.3	55	229.1
MAX	29.5	62	230.0

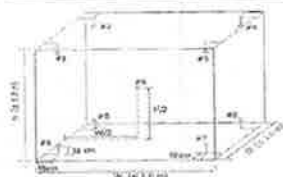


Table1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
104	104.51	104.81	104.21	104.35	103.34	103.28	103.34	103.03	103.28	0.82
110	110.80	111.16	110.51	110.64	109.63	109.64	109.63	109.34	109.58	0.83
180	181.02	181.32	180.02	180.44	179.66	179.96	179.64	179.40	179.70	0.95

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
103	103	103	103	0.21	1.71	2.11
109	109	109	109	0.21	1.78	2.12
176	176	176	176	0.31	2.05	2.51

**Note** The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

UUC\* = Unit Under Calibration

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

Uniformity = The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time.

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

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

----- End -----

# CAL

Calibratech Co.,Ltd.

7106-7 Moo 2, Sukhprachasun 3 Rd., Bangpood, Pakkred, Northaburi 11120

Tel:021 964-6211 Fax:021 964-5155, e-mail: calibratech.cal@yahoo.com, calibratech.cal@hotmail.com



## Certificate of Calibration

**Certificate No. :** 65-420016-1

**Page : 1 of 2**

**Submitted by :** Secht Co.,Ltd.

239 RimKlongprapa Road, Bangsue, Bangkok 10800 Thailand

**Equipment :** pH Meter with electrode

pH meter

**Manufacturer :** Mettler Toledo **Model :** Seven2Go S2

**Range :** N/A **pH** **Resolution :** 0.01 pH

**Serial No. :** B924795409 **ID No. :** N/A

**Electrode**

**Model :** InLab Expert Go-ISM **Serial No. :** 7861180

**Environment :** Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15) %

**Date of Received :** 15 February 2022

**Date of Calibration :** 24 February 2022

**Date of Issue :** 24 February 2022

**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
440001	21E997	17 Mar 2023	National Institute of Metrology Thailand (NIMT)

2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.008	61235182	795894	14 Feb 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.985	61223875	769927	15 May 2022	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
10.008	61244986	795895	25 Feb 2023	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :

( Bunjerd Masri )

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co.,Ltd.



# CAL

Calibratech Co.,Ltd.

3106-7 Moo 2, Sukhprachan 3 Rd., Banggood, Pakkred, Nonthaburi 11120

Tel:(02) 954-6211 Fax:(02) 964-5155, e-mail : calibratech.cal@yaoo.com, calibratech.cal@hotmail.com

## Certificate of Calibration

Certificate No. : 65-420016-1

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	0	0.58
	0.0000	7	7.00	0	0	0.58
	-177.4800	10	10.00	-177	0	0.58

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	4.008	4.01	0.00	0.010
	6.985	7.00	-0.01	0.011
	10.008	10.01	0.00	0.014

### 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%

- o o o -

*B*



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SUI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-3717-3900-27 FAX. 0-2719-9484



Cert.No.: 21CH1690

Page.: 1 of 2

## Certificate of Calibration

Equipment :

Conductivity Meter

Manufacturer :

Hanna

Model :

HI98192

Serial No. :

05200046101

ID No. :

Condition As-Received:

Used Item

Received Date :

07 December 2021

Calibration Date :

13 December 2021

Reference :

2112-0144DN-2

Submitted by :

Secot Co.,Ltd.  
239 Rimkiongprapa Road,  
Bangsue, Bangkok 10800

Ambient Temperature :

(25 ± 2.5) °C

Relative Humidity :

(50 ± 15) %

Calibration Procedure:

In -house method :  
- CP-CH6 : based on direct measurement by  
using certified reference material (CRM)

Calibrated by :

Walaiaak Sirthean

Approved by :

*Malee*  
Approved Signatory

( / ) Malee Bufruea

( ) Saithip Meangmai

( ) Warakorn Lemgatrakul

Issue Date :

15 December 2021

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written

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

A 0035796







National Food Institute, Ministry of Industry, Thailand

21000 Sor 20, Pongkarn Road, Bang Na, Bangkok 10700, Thailand  
Tel: +66 (0) 2422 0549 Fax: +66 (0) 2422 0550 Website: www.nfi.go.th E-mail: info@nfi.go.th



## Calibration Report

**Certificate No.:** 2104065-002-01  
**Equipment:** CHAMBER (Incubator)  
Model: ICP 400 Serial No.: K406.0004  
Resolution: 0.1 °C ID No.: N/A  
Manufacturer: MEMMERT

**Date of Calibration:** 2 August 2021

Page 2 of 3

**Location:** Laboratory, SECOT CO., LTD.  
**Environment Condition:** Ambient Temperature ( 32 ± 1 ) °C  
Relative Humidity ( 60 ± 5 ) %  
Line Voltage ( 229 ± 1 ) Volt

### Condition of this results of Calibration:

- This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-014 Based on TLAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.  
- The temperature scale used was based on ITS - 90.  
- All data show below were final values and the initial data may be obtained upon request.

### 2. Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY49016894	TE 640400-01	24 April 2022	NATIONAL FOOD INSTITUTE
	RTD	CH#201-209/ RTD#201-209			

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

### UUC Description :

Time of Record 1 Hour 9 Minute At 20.0 °C  
Fresh air Damper ☒ Open Position ☐ Close  
☒ Not Available

- Result of Calibration : ☒ Without adjustment ☐ After adjustment

ALZ



National Food Institute, Ministry of Industry, Thailand

21000 Sor 20, Pongkarn Road, Bang Na, Bangkok 10700, Thailand  
Tel: +66 (0) 2422 0549 Fax: +66 (0) 2422 0550 Website: www.nfi.go.th E-mail: info@nfi.go.th



## Calibration Report

**Certificate No.:** 2104065-002-01  
**Equipment:** CHAMBER (Incubator)  
Model: ICP 400 Serial No.: K406.0004  
Resolution: 0.1 °C ID No.: N/A  
Manufacturer: MEMMERT

**Date of Calibration:** 2 August 2021

Page 3 of 3

**Calibration point:** 20.0 °C

### Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
MIN	30.9	55	228.8
MAX	31.9	65	230.1

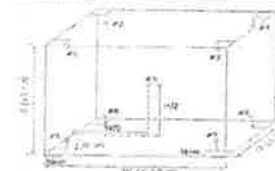


Table1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
20.0	19.99	20.07	20.13	20.03	20.05	19.98	20.00	20.06	20.02	0.27

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
20.0	20.0	20.0	20.0	0.062	0.12	0.27

**Note** The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

UUC\* = Unit Under Calibration

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

Uniformity = The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time.

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

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

----- End -----

ALZ



**MAINTENANCE REPORT**  
**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL**  
**3110 + HGA600 + FIAS100 + AMALGAM**

Customer : บริษัท ซีคอต จำกัด Date Tested: December 16, 2021  
 Address : 239 ถนนริมคลองประปา Recommendation Recertification  
 แขวงบางซื่อ เขตบางซื่อ Period 6 Months  
 กรุงเทพฯ 10800 Recertification Due: June 16, 2022  
 User Name: คุณ อรยา Visit Number: 2 OF 2  
 Phone: 02-9593600 ext. 507 TH Onesource Phone: 081-7316733  
 E-mail: labmail@secot.co.th E-mail: thonesource@gmail.com

**CONFIGURATION TESTED**

MODEL	SERIAL NUMBER	SOFTWARE
AA-3110	311N6062102	AAWINLAB 3.2
HGA 600	2698	
AS 60	2124	
FIAS 100	1114	
AMALGAM	160S2110102	

TEST STANDARD USED	PART NUMBER
Copper	N9300183
GFAAS Mixed STD	N9300244
PE standard of Mercury	N9300174



**MAINTENANCE REPORT**  
**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL**  
**3110 + HGA600 + FIAS100 + AMALGAM**

SERIAL NUMBER 311N6062102 DATE TESTED December 16, 2021

**1. OPTIC CHECKS**

- A. Optical alignment condition (if necessary) ☐ OK  
 B. Condition of Mirrors, Lenses etc. ☐ OK  
 C. D2 and HCL beam adjust (if necessary) ☐ OK

**2. ELECTRONICS CHECKS**

- A. Power Supplies  
 + 5.00 Vdc  $\pm$  0.2 Vdc + 5.0 Vdc  
 + 11.50 Vdc  $\pm$  0.2 Vdc + 11.4 Vdc  
 + 15.00 Vdc  $\pm$  1.0 Vdc + 15.2 Vdc  
 - 15.00 Vdc  $\pm$  1.0 Vdc - 14.9 Vdc  
 B. D2 Power supplies  
 +150 Vdc NA Vdc  
 + 450 Vdc NA Vdc  
 C. PMT Power supply  
 - 250 Vdc -249.0 Vdc

**3. GAS SYSTEM CHECKS**

- A. Leak test all internal and external gas box joints ☐ OK  
 B. All gas box safety features ☐ OK  
 C. Burner system including nebulizer and all o-ring and gasket ☐ OK  
 D. Drain system ☐ OK

**4. FIAS CHECK**

- A. Output power supplies  
 +5 VDC  $\pm$  0.25 VDC. 5.01 VDC. +40 VDC.  $\pm$  0.5 VDC. 40.02 VDC.  
 B. Valve and pump clean ☐ OK



**MAINTENANCE REPORT**  
**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL**  
**3110 + HGA600 + FIAS100 + AMALGAM**

SERIAL NUMBER 311N6062102DATE TESTED December 16, 2021**5. PERFORMANCE TEST FOR FLAME**

- A. Optical Filter 0.2 %, 1.0 % Abs At 324.8 nm  $\pm$  10 % 0.173, 0.992 Abs.
- B. Performance Tests with PE standard.
- B1. Run Std. Of Cu and Cr at 324.8 ; 357.9 nm, Concentration 4 , 4 ppm respectively  
 Results = 0.213, 0.242 Abs, with flow spoiler. respectively  
 Characteristic Concentration 0.083 ; 0.073 mg/L respectively
- B2. Run Std. of Pb at 283.3 nm; Concentration 20 ppm  
 Results = 0.195 Abs, with flow spoiler.  
 Characteristic Concentration 0.451 mg/L
- C. Performance Tests (For C<sub>2</sub>H<sub>2</sub> + N<sub>2</sub>O Flame)
- Run Std. Of Al at 309.3 nm; Concentration 50 ppm  
 Results = 0.230 Abs, with flow spoiler.  
 Characteristic Concentration 0.957 mg/L

**6. PERFORMANCE TEST FOR FIAS****ACTUAL VALUE**

- A. Characteristic mass for Mercury  
 ( 500 ul of 10 ug/l Hg for 0.07 Abs. ) 0.066 Abs.  
 Characteristic Mass 314 pg / 0.0044 Abs. 333.3 pg/0.0044 Abs.  
 RSD  $\leq$  2% 0.54 %
- B. Characteristic mass for Arsenic  
 ( 500 ul of 10 ug/l As for 0.45 Abs. ) 0.441 Abs.  
 Characteristic Mass 48 pg / 0.0044 Abs. 49.9 pg/0.0044 Abs.  
 RSD  $\leq$  2% 1.57 %
- C. Characteristic mass for Mercury Amalgamation  
 ( 1000 ul of 1.0 ug/l Hg for 0.03 Abs. ) 0.0311 Abs.  
 Characteristic Mass 147 pg / 0.0044 Abs. 141.9 pg/0.0044 Abs.  
 RSD  $\leq$  2% 1.84 %



**MAINTENANCE REPORT**  
**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL**  
**3110 + HGA600 + FIAS100 + AMALGAM**

SERIAL NUMBER 311N6062102DATE TESTED December 16, 2021**7. PERFORMANCE CHECK FOR FURNACE**

- A. Internal & External gas flow ☐ OK
- B. Contract Cylinder ( replace if necessary ) ☐ OK
- C. Quartz Windows ☐ OK
- D. Gas Tubing and Joins ☐ OK
- E. Cooling System ☐ OK
- 8. AUTOSAMPLER CHECK**
- A. Arm and gears ☐ OK
- B. Sample and Rinse Pump ☐ OK
- C. Tray and Sensors ☐ OK

**9. PERFORMANCE TEST FOR FURNACE****ACTUAL VALUE**

- Test run using Chromium**
1. Standard Deviation after 5 replicates of blank  $\leq$  0.005 0.001
2. Characteristic mass ( 5 ug / L for Cr, 3 pg/0.0044 A-s ) 2.8 pg / 0.0044 A-s  
 Peak Area 0.156 A-s  
 Relative Standard Deviation  $\leq$  5 % 3.37 %
- Test run using Lead**
- Characteristic mass ( 20 ug / L for Pb, 10 pg/0.0044 A-s ) 11.1 pg / 0.0044 A-s  
 Peak Area 0.159 A-s  
 Relative Standard Deviation  $\leq$  5 % 0.73 %



**MAINTENANCE REPORT**  
**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL**  
**3110 + HGA600 + FIAS100 + AMALGAM**

SERIAL NUMBER 311N6062102 DATE TESTED December 16, 2021

Remarks :

NA Mean no applicant

This is to certify that the above tests have been performed and the configuration tested



meets



does not meet

the PerkinElmer Specifications listed on this certificate.

This certificate does not modify PerkinElmer's standard terms and condition of sale,  
including warranty terms.

**TH ONE SOURCE CO., LTD.**



*Krungchai T.*

Krungchai Treevlchien )

Customer Support Engineer