

## ภาคผนวกที่ 5

### เอกสารสอบเทียบความถูกต้องของเครื่องมือ

ภาคผนวกที่ 5.1 เอกสารสอบเทียบเครื่องมือตรวจวัดคุณภาพน้ำทิ้ง

ภาคผนวกที่ 5.1

เอกสารสอบเทียบเครื่องมือตรวจวัดคุณภาพน้ำทิ้ง



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)  
Mechanical Engineering Standards Laboratory Soi 1, Bangpoo industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No. 23-64 / 0468

MTC.No. 23-64 / 0468 - 02

Number of Page(s) 2

## CALIBRATION CERTIFICATE

Nomenclature : "witeg" MEASURING BURET

Serial No. SV-TL.068/2559 Capacity 25 ml

Submitted by : ENVIRPRO CO., LTD.

168/28 Nakniwas Road, LatPhrao, Bangkok 10230, Thailand.

Received date : 25 May 2021

Calibration date : 11 June 2021

Calibration Method : ASTM E 542 - 01 (Reapproved 2021) , to deliver


Calibration range : 0 ml to 12.5 ml, 0 ml to 25 ml

Condition of the item : Normal

Calibration location : Room 118, MTC.

Ambient condition : Temperature (  $23 \pm 2.5$  ) °C , Relative Humidity (  $50 \pm 10$  ) %  
Barometric Pressure 752 mm Hg

Measuring Equipment : 1. Balance, Serial No. B611208844 traceable to NIMT through accredited TISTR Certificate No. MTC.No. 23-64 / 0182 - 01 due date 14 January 2022  
2. Digital Thermometer with sensor, Serial No.0000050 traceable to International system of Units ( SI ) through accredited TISTR Certificate No. MTC.No. PSL-T 285 / 64 due date 11 January 2022  
3. Barometer, Serial No. MEL-5203 traceable to NIMT through accredited TISTR Certificate No. MTC.No. 23-64 / 0310 due date 29 March 2022

CALIBRATED BY :   
( Ms.Phanida Jettana )

APPROVED BY :   
( Ms.Kirana Luanghirun )  
Director

  
( Ms.Phlapphideng Nakkead )

MECHANICAL ENGINEERING STANDARDS LABORATORY

Ref. 2073164052502210002

Issued Date : 21 June 2021

The results relate only to the items tested or calibrated.

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.BLMTC.002 Rev.3

### Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

### Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

### Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)  
Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No. 23-64 / 0468

2 / 2

MTC.No. 23-64 / 0468 - 02

**Nomenclature :** "witeg" MEASURING BURET

Serial No. SV-TL.068/2559 Capacity 25 ml  
Delivery Time 65 sec.

**Calibration Result :** based on the gravimetric determination of the quantity of water which is converted to true volume at the standard temperature of 20 °C

Unit : ml

Nominal volume	Measured volume	Uncertainty
12.5	12.516 7	$\pm 0.004\ 2$
25	25.037 0	$\pm 0.004\ 5$

**Note :** 1) The reported expanded uncertainties are based on a standard uncertainties multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%.

**The end of Calibration Certificate**

The results relate only to the items tested or calibrated.  
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.3

**Head Office**

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Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
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**Office/Laboratory**

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

**Office**

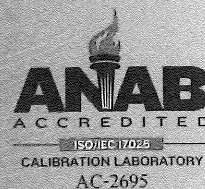
196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th





THAI HEART CALIBRATION CO., LTD.

112/1 Moo 5, Phraek Sa, Muang, Samut Prakan 10280  
Tel. 0-2394-2162, 0-2757-8435, 0-2757-8496 Fax: 0-2757-8507



## CERTIFICATE OF CALIBRATION

Certificate No.: C1-0607001/21

Page 1 of total 3 pages

Customer ENVIRPRO CO., LTD.  
168/28 Nakniwas Rd., Ladprao, Bangkok 10230

Equipment	Spectrophotometer		
Manufacturer	HACH	Model	DR 6000
Serial No.	1893325	ID No.	SV-TL.110/2562
Description	-		

Environmental Conditions Ambient Temperature: 29.1 °C  
Relative Humidity: 51 %  
Atmospheric Pressure: -

Calibration Location Analysis Laboratory 1

Received Date 6 July 2021

Calibration Date 6 July 2021

Date of Issue 7 July 2021

Checked by

Act as Technical Manager

Approved by

Representative of Managing Director

( ) ( Krisyosl K. )	( ) ( Sakda Y. )
( ) ( Patiphan K. )	( / ) ( Onnapa P. )
( ) ( Pongsak H. )	( ) ( Nitiphong K. )
( ) ( Kanung C. )	( ) ( Nonthachai K. )
( ) ( Pramong P. )	( ) ( Noppol P. )

( Dr. Ekachai Puttitwong )

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**Certificate No.:** C1-0607001/21

**Page 2 of total 3 pages**

**Reference Method:**

- The calibration method used was CP-004 based on an in-house method.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

**Reference Standard Instruments:**

Type	Model	Serial No.	Certificate No.	Due Date	Traceability
Holmium Glass Filter	RM-HG	34645	91780	Apr. 30, 2023	Starna
Didymium Glass Filter	RM-DG	11978	82749	Mar. 17, 2022	
Neutral Density Filter	RM-1N2N3N	11562	82757	Mar. 17, 2022	
60 mg/l Potassium Dichromate	RM-06	31473	82394	Mar. 6, 2022	

**Remark:** This certificate is traceable to the International System of Unit (SI Unit) through:

- Starna Scientific Ltd.

**Measurement Results:**

Spectral Bandwidth : 2 nm

**1. Wavelength accuracy**

Standard Wavelength ( nm )	UUC Reading ( nm )	Correction ( nm )	Uncertainty ( ± nm )
361.00	360.0	1.00	0.14
418.61	418.3	0.31	0.14
536.66	535.9	0.76	0.13
684.49	684.2	0.29	0.14
748.48	748.3	0.18	0.14

Calibrated by Kittipong  
REV.02 02/24/21

**Certificate No.:** C1-0607001/21

**Page 3 of total 3 pages**
**Measurement Results (Cont.):**
**2. Photometric Accuracy**
**UV Region**

Wavelength ( nm )	Standard Value ( Abs )	UUC Reading ( Abs )	Correction ( Abs )	Uncertainty ( $\pm$ Abs )
235	0.7453	0.743	0.0023	0.0050
257	0.8637	0.859	0.0047	0.0050
313	0.2908	0.293	-0.0022	0.0050
350	0.6406	0.638	0.0026	0.0050

**Visible Region**

Wavelength ( nm )	Standard Value ( Abs )	UUC Reading ( Abs )	Correction ( Abs )	Uncertainty ( $\pm$ Abs )
440	1.0340	1.035	-0.0010	0.0029
	0.7305	0.731	-0.0005	0.0029
	0.5418	0.542	-0.0002	0.0028
465	0.9638	0.964	-0.0002	0.0028
	0.6745	0.675	-0.0005	0.0028
	0.4925	0.493	-0.0005	0.0028
546.1	0.9957	0.993	0.0027	0.0028
	0.6847	0.683	0.0017	0.0028
	0.5073	0.506	0.0013	0.0028
590	1.0356	1.032	0.0036	0.0028
	0.7145	0.712	0.0025	0.0028
	0.5362	0.535	0.0012	0.0028
635	0.9879	0.985	0.0029	0.0028
	0.6825	0.680	0.0025	0.0028
	0.5212	0.520	0.0012	0.0028

UUC : Unit Under Calibration.

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

- End of Certificate -

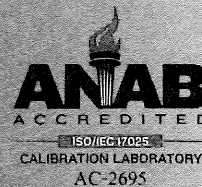
Calibrated by Kittipong  
REV.02 02/24/21



THAI HEART CALIBRATION CO., LTD.

112/1 Moo 5, Phraek Sa, Muang, Samut Prakan 10280

Tel. 0-2394-2162, 0-2757-8435, 0-2757-8496 Fax. 0-2757-8507



## CERTIFICATE OF CALIBRATION

Certificate No.: T1-0607003/21

Page 1 of total 3 pages

Customer ENVIRPRO CO., LTD.  
168/28 Nakniwas Rd., Ladprao, Bangkok 10230

Equipment	Incubator		
Manufacturer	ACCUPLUS	Model	i250DS
Serial No.	I250402-0510-0315	ID No.	SV-TL.030/2553
Description	Resolution of UUC : 0.1 °C		

Environmental Conditions Ambient Temperature: 27.2 °C  
Relative Humidity: 38 %  
Atmospheric Pressure: -

Calibration Location Analysis Laboratory 2

Received Date 6 July 2021

Calibration Date 6 July 2021

Date of Issue 7 July 2021

Checked by

Act as Technical Manager

Approved by

Representative of Managing Director

( ) ( Krisyosl K. )	( ) ( Sakda Y. )
( ) ( Patiphan K. )	( ) ( Onnapa P. )
( / ) ( Pongsak H. )	( ) ( Nitiphong K. )
( ) ( Kanung C. )	( ) ( Nonthachai K. )
( ) ( Pramong P. )	( ) ( Noppol P. )

( Dr. Ekachai Puttitwong )

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**Certificate No.:** T1-0607003/21

**Page 2 of total 3 pages**
**Reference Method:**

- The calibration method used was CP-084 based on TLAS G-20-1/02-08 (E).
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

**Reference Standard Instruments:**

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Data Logger with Sensors	34972A/ 34901A	MY59001773/ MY41166069	I0-0401001/21	Jan. 5, 2022	THC

**Remark:** This certificate is traceable to the International System of Unit (SI Unit) through:

- THC, Thai Heart Calibration Co., Ltd.

**Measurement Results:** ( X ) Without Adjustment

**Reporting of Temperature Distribution**

UUC Reading (°C)	Measured Temperature (°C) @ sensor No. (Sensor No. 9 is Ref.)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9	
4.0	4.68	4.64	4.68	4.93	4.52	4.52	4.55	4.55	4.48	0.10

**Reporting of Chamber Performance**

Setting Temperature (°C)	UUC Reading (°C)	Uniformity (°C)	Stability (°C)	Overall Variation (°C)
4.0	4.0	0.59	0.39	1.04

UUC: Unit Under Calibration

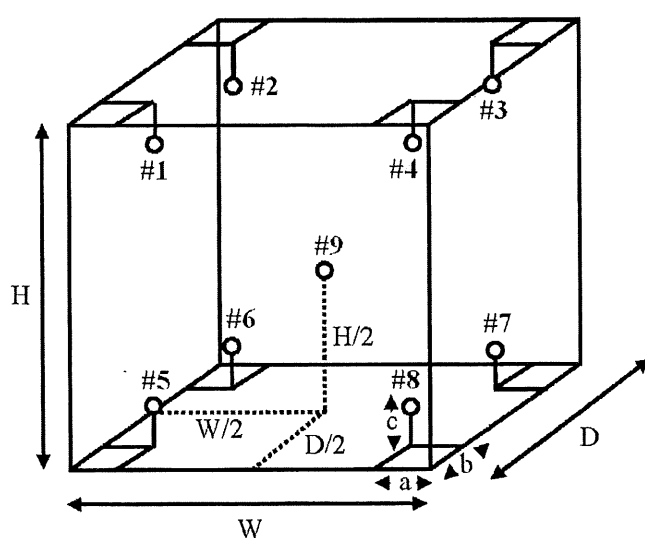
Calibrated by Pichet  
REV.02 02/24/21

Certificate No.: T1-0607003/21

Page 3 of total 3 pages

Measurement Results (Cont.):

**Sensor Installation**



Working space :

W x H x D 50 cm.x 104 cm.x 46 cm.

a x b x c 5 cm.x 5 cm.x 5 cm.

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

- End of Certificate -

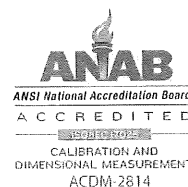


CLC  
Accredited  
ISO/IEC 17025

# CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yeak 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : DISSOLVED OXYGEN METER  
MANUFACTURER : YSI  
MODEL / TYPE : 5000-115  
SERIAL NO. : 17C104148[SV-TL.079/2560]  
CLID. NO. : 272101627  
JOB CONTROL NO. : 210710064169

CUSTOMER : ENVIRPRO CO., LTD.  
168/28 NAKNIWAS RD., LADPRAO,  
BANGKOK 10230 THAILAND

DATE OF RECEIVED : 10 July 2021

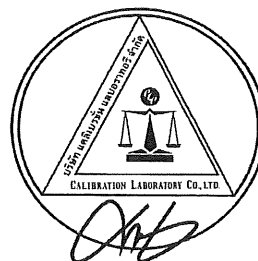
DATE OF ISSUED : 14 July 2021

Report of calibration screening must not be taken in part, Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Sukgasem Sechanart  
Calibration Engineer

Approved By : Mongkol Yotsoontorn  
Authorized Signatory

14 July 2021



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q21064169

F3-011-04/01-12

page 1 of 3

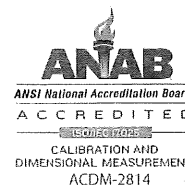


@clccalibration



# CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yeak 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## REPORT OF CALIBRATION

### FOR

NOMENCLATURE : DISSOLVED OXYGEN METER  
MANUFACTURER : YSI  
MODEL / TYPE : 5000-115  
SERIAL NO. : 17C104148[SV-TL.079/2560]  
DATE OF CALIBRATION : 12 July 2021

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#### ENVIRONMENT CONDITIONS :

Temperature :  $(25 \pm 2.5) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15) \% \text{RH}$

#### PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPCH-06**. The calibration was performed by direct measurement with Certified Reference Material (CRM).

#### REFERENCE STANDARD USED :

Dissolved Oxygen, Sigma-Alorich Product ID QC3077-500ML .

#### TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Sigma-Alorich.

Lot LRAC4478, Due Date January 2022.

#### UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2,00$  which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. **Q21064169**

**F3-011-04/01-12**

page 2 of 3



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# CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yeak 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



**CONDITION OF CALIBRATION ITEM : GOOD**

**MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment**

The table in the following gives the calibration results and associated measurement uncertainties of Dissolved Oxygen Meter.

## CALIBRATION DATA

Nominal Value ( mg/L )	DUC Reading ( mg/L )	Correction ( mg/L )	Uncertainty ( mg/L )
8.49	8.48	+0.01	± 0.31

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 007 Page 4 of 57

**This report is valid for the above stated instrument/s only.**

**### End of Certificate ###**

Certificate No. Q21064169

F3-011-04/01-12

page 3 of 3



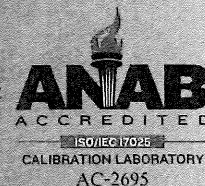
@clccalibration



THAI HEART CALIBRATION CO., LTD.

112/1 Moo 5, Phraek Sa, Muang, Samut Prakan 10280

Tel. 0-2394-2162, 0-2757-8435, 0-2757-8496 Fax : 0-2757-8507



## CERTIFICATE OF CALIBRATION

Certificate No.: T1-0607002/21

Page 1 of total 3 pages

Customer ENVIRPRO CO., LTD.  
168/28 Nakniwas Rd., Ladprao, Bangkok 10230

Equipment	Hot Air Oven		
Manufacturer	MEMMERT	Model	UFE400
Serial No.	G410.0133	ID No.	SV-TL.021/2553
Description	Resolution of UUC : 0.5 °C		

Environmental Conditions Ambient Temperature: 29.2 °C  
Relative Humidity: 53 %  
Atmospheric Pressure: -

Calibration Location Analysis Laboratory 1

Received Date 6 July 2021

Calibration Date 6 July 2021

Date of Issue 7 July 2021

Checked by

Act as Technical Manager

Approved by

Representative of Managing Director

( ) ( Krisyosl K. )	( ) ( Sakda Y. )
( ) ( Patiphan K. )	( ) ( Onnapa P. )
(✓) ( Pongsak H. )	( ) ( Nitiphong K. )
( ) ( Kanung C. )	( ) ( Nonthachai K. )
( ) ( Pramong P. )	( ) ( Noppol P. )

( Dr. Ekachai Puttitwong )

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**Certificate No.:** T1-0607002/21

**Page 2 of total 3 pages**

**Reference Method:**

- The calibration method used was CP-084 based on TLAS G-20-1/02-08 (E).
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

**Reference Standard Instruments:**

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Data Logger with Sensors	34972A/ 34901A	MY57010605/ MY59005437	10-1108002/20	Aug. 13, 2021	THC

**Remark:** This certificate is traceable to the International System of Unit (SI Unit) through:

- THC, Thai Heart Calibration Co., Ltd.

**Measurement Results:** ( X ) Without Adjustment

**Reporting of Temperature Distribution**

UUC Reading (°C)	Measured Temperature (°C) @ sensor No. (Sensor No. 9 is Ref.)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9	
104.0	104.94	104.49	104.30	103.96	104.27	104.23	104.67	104.24	104.32	0.29
180.0	181.31	180.45	179.91	179.23	180.14	180.17	180.89	179.90	180.15	0.29

**Reporting of Chamber Performance**

Setting Temperature (°C)	UUC Reading (°C)	Uniformity (°C)	Stability (°C)	Overall Variation (°C)
104.0	104.0	0.72	0.22	1.19
180.0	180.0	1.35	0.46	2.42

UUC: Unit Under Calibration

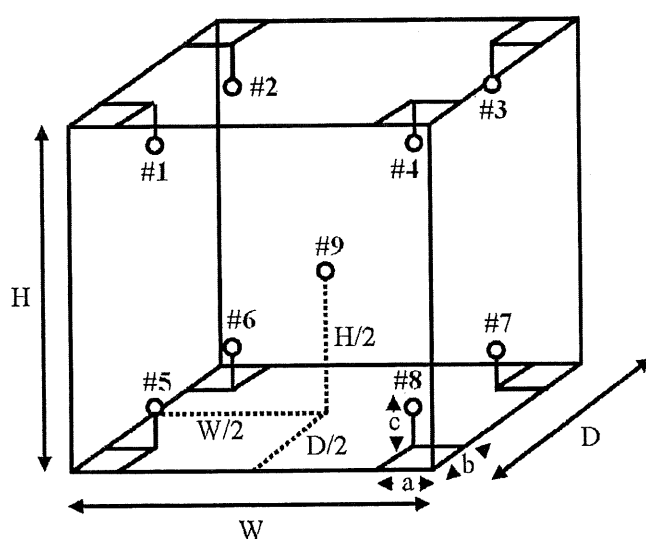
Calibrated by Pichet

Certificate No.: T1-0607002/21

Page 3 of total 3 pages

Measurement Results (Cont.):

**Sensor Installation**



Working space :

W x H x D 40 cm.x 40 cm.x 33 cm.

a x b x c 5 cm.x 5 cm.x 5 cm.

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

- End of Certificate -

Calibrated by Pichet



# CALIBRATION LABORATORY CO., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## CERTIFICATE OF CALIBRATION

### FOR

NOMENCLATURE : pH METER  
MANUFACTURER : HANNA  
MODEL / TYPE : HI2211/HI1131/N/A  
SERIAL NO. : H0064643/0347487N/TH118405[SV-TL.080/2560]  
CLID. NO. : 272101552  
JOB CONTROL NO. : 210706061668

CUSTOMER : ENVIRPRO CO., LTD.  
168/28 NAKNIWAS RD., LADPRAO,  
BANGKOK 10230 THAILAND

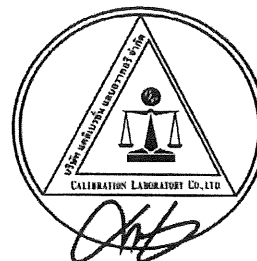
DATE OF RECEIVED : 06 July 2021

DATE OF ISSUED : 10 July 2021

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Prapaporn Khanchalee  
Pimsiri Hemtanon  
Calibration Engineer

Approved By : Mongkol Yotsoontorn  
Authorized Signatory  
10 July 2021



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI)

Certificate No. Q21061668

F3-011-04/01-12

page 1 of 3



@clccalibration



# CALIBRATION LABORATORY Co., LTD.

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## REPORT OF CALIBRATION FOR

NOMENCLATURE : pH METER  
MANUFACTURER : HANNA  
MODEL / TYPE : HI2211/HI1131/N/A  
SERIAL NO. : H0064643/0347487N/TH118405[SV-TL.080/2560]  
DATE OF CALIBRATION : 06 July 2021

### ENVIRONMENT CONDITIONS :

Temperature :  $(25 \pm 2.5) ^\circ\text{C}$

Relative Humidity :  $(50 \pm 15) \% \text{ RH}$

### PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-128, 187**. The calibration was performed by direct measurement with Certified Reference Material (CRM) and comparison with Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

### REFERENCE STANDARD USED :

1. pH Standard Solution, TRM CODE TRM-S-2003, TRM CODE TRM-S-2007.
2. Certipur<sup>®</sup> Buffer Solution pH 7.00 , Product Number. 1.09407.1000.
3. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
4. Precision Thermometer, ASL Model F201 S/N. 016168/09.
5. IPRT, Wika Model CTP5000-250-D S/N. PO00043543-1-10-1.

### TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand). Lot Number. 160221 , 180121. Due Date 14 June 2022.
2. The measurements are traceable to International System of Units (SI) , through Merck Co., Ltd. Certificate No. HC02424407 , Due Date 30 June 2023.
3. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd. Certificate No. Q21006472, Due Date 23 January 2022.
4. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR). Certificate No. PSL-T 814/63, Due Date 12 August 2021.
5. The measurements are traceable to International System of Units (SI) , through National Institute of Metrology (Thailand). Certificate No. TT-0095-20, Due Date 01 October 2021.

### UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor complies with the table which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. **Q21061668**

**F3-011-04/01-12**

page 2 of 3



@clccalibration



**CLC**  
Accredited  
ISO/IEC 17025

# CALIBRATION LABORATORY CO., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230  
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



NSC-TISI-TIS 17025  
CALIBRATION 0059  
CLC

**CONDITION OF CALIBRATION ITEM : GOOD**

**MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment**

The table in the following gives the calibration results and associated measurement uncertainties of pH meter.

## CALIBRATION DATA

### 1. pH METER RESULT @ 25 °C

Standard pH Buffer Solution (pH)	pH Meter Reading (pH)	pH Meter Reading (mV)	Correction (pH)	Uncertainty of pH Measurement ( $\pm$ pH)	k Factor
4.000	3.99	168.4	+0.010	0.014	2,20
6.990	7.00	-5.8	-0.010	0.021	2,00
10.007	10.00	-182.2	+0.007	0.100	2,09

Note. The Scope of Accredited TISI Certificate No. 19C087/0655 Issue 1 Page 79 of 111

### 2. TEMPERATURE RESULT [THERMISTOR]

Immersion depth (mm)	Actual Temperature ( °C )	DUC Reading ( °C )	Correction ( °C )	Uncertainty $\pm$ ( °C )
104	25.00	25.0	0.00	0.07

Note. Probe  $\varnothing$  3 mm

Materials : Stainless Steel.

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor of  $k = 2,00$ .

The Scope of Accredited TISI Certificate No. 19C087/0655 Issue 1 Page 28 of 111

**This report is valid for the above stated instrument/s only.**

**### End of Certificate ###**

Certificate No. Q21061668

F3-011-04/01-12

page 3 of 3



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# CALIBRATION LABORATORY Co., LTD.

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : LIQUID IN GLASS THERMOMETER  
MANUFACTURER : N/A  
MODEL / TYPE : 0-100 °C  
SERIAL NO. : N/A [SV-TL.020/2551]  
CLID. NO. : 232102154  
JOB CONTROL NO. : 210706061663

CUSTOMER : ENVIRPRO CO., LTD.  
168/28 NAKNIWAS RD., LADPRAO,  
BANGKOK 10230 THAILAND

DATE OF RECEIVED : 06 July 2021

DATE OF ISSUED : 09 July 2021

Report of calibration screening must not be taken in part. Except complete. Without the approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Tanawan Seenam-Ngoen  
Calibration Engineer

Approved By : Mongkol Yotsoontorn  
Authorized Signatory  
09 July 2021



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement  
according to the International System of Units ( SI )

Certificate No. Q21061663

F3-011-04/01-12

page 1 of 3



@clccalibration





# CALIBRATION LABORATORY Co., LTD.

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



## REPORT OF CALIBRATION

### FOR

NOMENCLATURE : LIQUID IN GLASS THERMOMETER  
MANUFACTURER : N/A  
MODEL / TYPE : 0-100 °C  
SERIAL NO. : N/A [SV-TL.020/2551]  
DATE OF CALIBRATION : 09 July 2021

#### ENVIRONMENT CONDITIONS :

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

Relative Humidity :  $(55 \pm 10) \% \text{ RH}$

#### PROCEDURE USED :

This instrument was calibrated under procedure No. **WI-305-64** based on ASTM E 77-07 as calibration guidelines.

The calibration was performed by comparison with Calibration Bath, Precision Thermometer and IPRT which maintained by the Calibration Laboratory Co., Ltd.

#### REFERENCE STANDARD USED :

1. Calibration Bath, Kambic Model OB-22/2 ULT S/N. 17115653.
2. Precision Thermometer, ASL Model F201 S/N. 016168/09 with IPRT S/N. PO00043543-1-10-1, PO00043543-1-10-19.

#### TRACEABILITY :

1. The measurements are traceable to International System of Units (SI) , through Calibration Laboratory Co., Ltd.

Certificate No. Q21006472, Due Date 23 January 2022.

2. The measurements are traceable to International System of Units (SI) , through Thailand Institute of Scientific and Technological Research (TISTR) and National Institute of Metrology (Thailand).

Certificate No. PSL-T 814/63, TT-0095-20, TT-0096-20. Due Date 12 August 2021, 01 October 2021.

#### UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2,00$  which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2013)"

Certificate No. Q21061663

F3-011-04/01-12

page 2 of 3



@clccalibration



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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



**CONDITION OF CALIBRATION ITEM : GOOD**

**MEASUREMENT RESULTS : ( X ) without adjustment ( ) adjustment**

The DUC Reading were recorded and the means value were reported of four times measurement in the table below.

## CALIBRATION DATA

### **CORRECTION OF TEMPERATURE**

STD Reading ( °C )	DUC Reading ( °C )	Correction ( °C )	Uncertainty $\pm$ ( °C )
*4.00	4.0	0.00	0.13
20.02	20.0	+ 0.02	
25.04	25.0	+ 0.04	

Range : 0 °C to 100 °C

Graduation : 1 °C

Immersion Type : Total Immersion.

Correction of Reference Temperature ( 0 °C ) = 0.0 °C

Note. \* means Calibrations marked " Not TISI Accredited " in this Certificate have been included for completeness.

The Scope of Accredited TISI Certificate No. 19C087/0655 Issue 1 Page 28 of 111

**This report is valid for the above stated instrument/s only.**

**### End of Certificate ###**

**Certificate No. Q21061663**

**F3-011-04/01-12**

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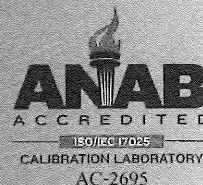
@clccalibration



THAI HEART CALIBRATION CO., LTD.

112/1 Moo 5, Phraek Sa, Muang, Samut Prakan 10280

Tel. 0-2394-2162, 0-2757-8435, 0-2757-8496 Fax : 0-2757-8507



## CERTIFICATE OF CALIBRATION

Certificate No.: T1-0607005/21

Page 1 of total 4 pages

Customer ENVIRPRO CO., LTD.  
168/28 Nakniwas Rd., Ladprao, Bangkok 10230

Equipment	Block Digestion Unit		
Manufacturer	VELP SCIENTIFICE	Model	DKL 12
Serial No.	465101	ID No.	SV-TL.084/2561
Description	Resolution of UUC : 1 °C		

Environmental Conditions Ambient Temperature: 29.7 °C  
Relative Humidity: 43 %  
Atmospheric Pressure: -

Calibration Location Analysis Laboratory 1

Received Date 6 July 2021

Calibration Date 6 July 2021

Date of Issue 7 July 2021

Checked by

Act as Technical Manager

Approved by

Representative of Managing Director

<input type="checkbox"/> ( Krisyosl K. )	<input type="checkbox"/> ( Sakda Y. )
<input type="checkbox"/> ( Patiphan K. )	<input type="checkbox"/> ( Onnapa P. )
<input checked="" type="checkbox"/> ( Pongsak H. )	<input type="checkbox"/> ( Nitiphong K. )
<input type="checkbox"/> ( Kanung C. )	<input type="checkbox"/> ( Nonthachai K. )
<input type="checkbox"/> ( Pramong P. )	<input type="checkbox"/> ( Noppol P. )

( Dr. Ekachai Puttitwong )

This calibration certificate shall not be reproduced other than in full except with the prior written approval of the Thai Heart Calibration Co., Ltd.

**Certificate No.:** T1-0607005/21

**Page 2 of total 4 pages**
**Reference Method :**

- The calibration method used was CP-142 based on an in-house method.
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

**Reference Standard Instruments:**

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Data Logger with Sensors	34972A/ 34901A	MY57010605/ MY59005437	I0-1108002/20	Aug. 13, 2021	THC

**Remark:** This certificate is traceable to the International System of Unit (SI Unit) through:

- THC, Thai Heart Calibration Co., Ltd.

**Measurement Results:**

Hole No.	UUC Setting (°C)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Stability of UUC (± °C)	Uncertainty (± °C)
# 1	150	157.2	150	7.2	0.06	0.58
# 2	150	155.8	150	5.8	0.10	
# 3	150	154.5	150	4.5	0.09	
# 4	150	156.4	150	6.4	0.05	
# 5	150	154.4	150	4.4	0.19	
# 6	150	155.4	150	5.4	0.11	
# 7	150	158.1	150	8.1	0.05	
# 8	150	154.4	150	4.4	0.09	
# 9	150	157.7	150	7.7	0.08	
# 10	150	156.7	150	6.7	0.11	
# 11	150	155.5	150	5.5	0.08	
# 12	150	157.5	150	7.5	0.07	

**Calibrated by**
**Pichet**

Certificate No.: T1-0607005/21

Page 3 of total 4 pages

Measurement Results (Cont.):

Hole No.	UUC Setting (°C)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Stability of UUC (± °C)	Uncertainty (± °C)
# 1	380	384.8	380	4.8	0.27	0.58
# 2	380	387.1	380	7.1	0.35	
# 3	380	385.1	380	5.1	0.31	
# 4	380	384.4	380	4.4	0.26	
# 5	380	387.7	380	7.7	0.27	
# 6	380	387.0	380	7.0	0.33	
# 7	380	387.2	380	7.2	0.27	
# 8	380	386.0	380	6.0	0.35	
# 9	380	386.1	380	6.1	0.30	
# 10	380	384.3	380	4.3	0.34	
# 11	380	383.2	380	3.2	0.35	
# 12	380	384.6	380	4.6	0.36	

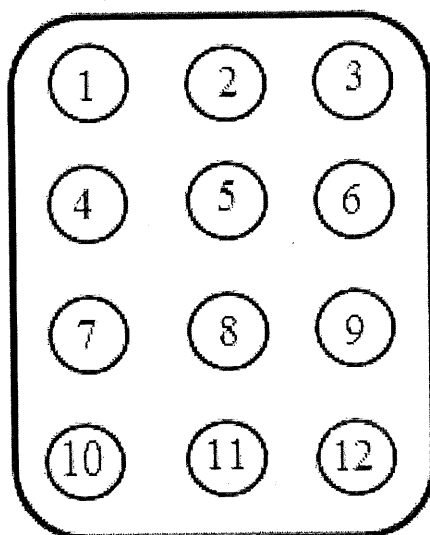
UUC : Unit Under Calibration

Calibrated by Pichet  
REV.02 02/24/21

Certificate No.: T1-0607005/21

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Measurement Results (Cont.):



**Front View**

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

- End of Certificate -

Calibrated by

Pichet

**PREVENTIVE MAINTENANCE REPORT**  
**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL**  
**AAAnalyst 200/400**

Customer :	บริษัท เอ็นไวร์โพร จำกัด	Date Tested:	08-Feb-2022
Address :	168/28 ถนนพหลโยธิน แขวงลาดพร้าว เขตลาดพร้าว กรุงเทพมหานคร 10230	Recommendation Recertification Period	6 Months
User Name:	คุณนันทิชา วรณสินธุ์	Recertification Due:	08-Aug-2022
Phone:	099-6062863	Date Last Certified:	04-Aug-2021
Fax/Email:	nanticha.wan@gmail.com	Visit Number:	1 of 2
		PerkinElmer Phone:	02-719-6420 ext 311
		PerkinElmer Fax:	02-319-7900

CONFIGURATION TESTED		
MODEL	SERIAL NUMBER	SOFTWARE
AAAnalyst 400	201S5082209	AA WinLab32 Version 7.2
FIAS 100	100S3020504	
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
Copper	N930-0183	OCT 30 2022
GFAAS Mixed	N930-0244	JUN 30 2023
MG0-141	N101-3000	
MG2-045	N101-3002	



**PREVENTIVE MAINTENANCE REPORT**  
**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL**  
**AAAnalyst 200/400**

<b>SERIAL NUMBER</b> <u>201S5082209</u>	<b>DATE TESTED</b> <u>08-Feb-2022</u>
<b>1. INSTRUMENT CHECKS</b>	
A. The mirror, prism and lenses condition. Clean if necessary.	<input type="checkbox"/> OK
B. Inspect the grating.	<input type="checkbox"/> OK
C. Inspect and clean or replace the dust filter.	<input type="checkbox"/> OK
D. Clean the burner head, chamber and end cap.	<input type="checkbox"/> OK
E. Clean the nebulizer.	<input type="checkbox"/> OK
F. Check the condition of the end cap, chamber and nebulizer o-rings.	<input type="checkbox"/> OK
G. Clean the drain system.	<input type="checkbox"/> OK
H. Clean exterior the instrument.	<input type="checkbox"/> OK
<b>2. GAS SYSTEM CHECKS</b>	
A. Leak test all internal and external gas box joints	<input type="checkbox"/> OK
B. Inspect the acetylene cartridge filter. (Replacement cartridge filter every 1 year)	<input type="checkbox"/> OK
C. Inspect the air cartridge filter. (Replacement cartridge filter every 6 months)	<input type="checkbox"/> OK
<b>3. ELECTRICAL</b>	
A. Check incoming AC line voltage for proper levels and grounding.	<input type="checkbox"/> OK
B. Check unit's software and firmware revisions and upgrade if necessary.	<input type="checkbox"/> OK
<b>4. FIAS CHECKS</b>	
A. Pump and 5 Port Valve	<input type="checkbox"/> OK
B. Chemifold and Tubing	<input type="checkbox"/> OK
C. Power Supply	<input type="checkbox"/> OK
D. Flow meter and Gas system	<input type="checkbox"/> OK



## PREVENTIVE MAINTENANCE REPORT

### ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

#### AAAnalyst 200/400

<b>SERIAL NUMBER</b> <u>201S5082209</u>	<b>DATE TESTED</b> <u>08-Feb-2022</u>
<b>PARAMETER</b>	<b>SPECIFICATION      ACTUAL VAULE</b>
<b>5. PERFORMANCE TESTS</b>	
1. Detector-Linearity with Barium (553.55 nm).	
Neutral Density Filter 0.2 :	<u>0.1903</u> Abs. $\pm$ 5% <u>0.1818</u> Abs.
Neutral Density Filter 1.0 :	<u>1.0547</u> Abs. + 5% <u>1.0394</u> Abs.
2. Baseline Noise at 1 Abs with Barium (553.55 nm).	
(at an integration time of 0.5 seconds and 99 replicates)	
	SD $\leq$ 0.010 Abs. <u>0.0024</u> Abs.
3. AA Baseline with Copper (Cu 324.75 nm).	
(at an integration time of 0.5 seconds and 99 replicates)	
	SD $\leq$ 0.001 Abs. <u>0.0002</u> Abs.
4. D <sub>2</sub> Background Compensation (Copper 324.75 nm).	
with Neutral Density Filter 1.0	Absorbance $\leq$ 0.010 Abs <u>-0.0037</u> Abs.
5. AA-BG Baseline Noise with Copper (324.75 nm).	
(at an integration time of 2.0 seconds and 99 replicates)	
	SD $\leq$ 0.005 Abs. <u>0.0003</u> Abs.
6. Flame Safety Interlock all Functions.	<div style="border: 1px solid black; padding: 2px 10px;">OK</div>

**PREVENTIVE MAINTENANCE REPORT**  
**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL**  
**AAAnalyst 200/400**

SERIAL NUMBER	201S5082209	DATE TESTED	08-Feb-2022
PARAMETER	SPECIFICATION	ACTUAL VAULE	
7. Wavelength Accuracy with Nickel (232.00 nm).			
Nickel Prism Position	± 190 steps	+ 14	Steps
Nickel Grating Position	+ 380, - 260 steps	+ 48	Steps
3 mg/L Ni Standard Mean Abs	≥ 0.200 Abs	0.271	Abs.
8. Flame Sensitivity with Copper (324.75 nm).			
Cu Prism Position	± 120	0	Steps
Cu Grating Position	± 380	+ 24	Steps
(2 mg/L Cu Standard at an integration time of 10 seconds and 10 replicates)			
Mean Absorbance	≥ 0.250	0.358	Abs.
Capacitance value	≥ 1.0 pF	4.0	pF

**PREVENTIVE MAINTENANCE REPORT**  
**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL**  
**AAAnalyst 200/400**

**SERIAL NUMBER** 201S5082209

**DATE TESTED** 08-Feb-2022

Remarks :

- Neutral Density Filter refer to data sheet

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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.

**Service Department PerkinElmer Ltd.**

Customer Service Engineer:

ชัยณรงค์ ธานี

( Chainarong Thanin )

Service Engineer