

เอกสารสอบเทียบความถูกต้องของเครื่องมือ

ภาคผนวกที่ 5.1 เอกสารสอบเทียบเครื่องมือตรวจวัดคุณภาพอากาศ

ภาคผนวกที่ 5.2 เอกสารสอบเทียบเครื่องมือตรวจวัดระดับเสียงทั่วไป

ภาคผนวกที่ 5.3 เอกสารสอบเทียบเครื่องมือตรวจวัดความสั่นสะเทือน

ภาคผนวกที่ 5.4 เอกสารสอบเทียบเครื่องมือตรวจวัดคุณภาพน้ำ

ภาคผนวกที่ 5.1

เอกสารสอบเทียบเครื่องมือตรวจวัดคุณภาพอากาศ

RECALIBRATION

DUE DATE:

June 9, 2022

Certificate of Calibration

Calibration Certification Information

Cal. Date: June 9, 2021 Rootsmeter S/N: 438320 Ta: 294 °K
 Operator: Jim Tisch Pa: 751.1 mm Hg
 Calibration Model #: TE-5025A Calibrator S/N: 0992

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3590	3.2	2.00
2	3	4	1	0.9630	6.4	4.00
3	5	6	1	0.8580	7.9	5.00
4	7	8	1	0.8140	8.8	5.50
5	9	10	1	0.6760	12.7	8.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
0.9974	0.7340	1.4154	0.9957	0.7327	0.8848
0.9932	1.0313	2.0017	0.9915	1.0296	1.2513
0.9912	1.1552	2.2380	0.9895	1.1532	1.3990
0.9900	1.2162	2.3472	0.9883	1.2141	1.4673
0.9848	1.4568	2.8308	0.9831	1.4543	1.7696
QSTD	m=	1.95234	QA	m=	1.22252
	b=	-0.01742		b=	-0.01089
	r=	0.99993		r=	0.99993

Calculations

Vstd= $\Delta Vol((Pa - \Delta P)/Pstd)(Tstd/Ta)$	Va= $\Delta Vol((Pa - \Delta P)/Pa)$
Qstd= $Vstd/\Delta Time$	Qa= $Va/\Delta Time$
For subsequent flow rate calculations:	
Qstd= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right)$	Qa= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} \right) - b \right)$

Standard Conditions

Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	rootsmeter manometer reading (mm Hg)
Ta:	actual absolute temperature (°K)
Pa:	actual barometric pressure (mm Hg)
b:	intercept
m:	slope

RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30



Certificate of Calibration

Certificate Number : SPR21120343-1

Page : 1 of 3

Customer : ENVIRPRO CO., LTD.

168/28 Nakniwas Rd., Ladprao, Bangkok 10230

Equipment Name : Electronic Balance

Manufacturer : AND

Model : HR-202i

Serial Number : 15201052

ID. Number : N/A

Environmental Conditions

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

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

Location of Calibration : In-Lab

Calibration Procedure : SP-CPM-04-01

Received Date : 23 Dec 2021

Calibration Date : 24 Dec 2021

Recommend Due Date : N/A

Date of Issue : 25 Dec 2021

Method of Calibration

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

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

Calibrated by : Mr.Kijja Visitsilp

Calibration Officer

Approved by :

(Mr.Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR21120343-1

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Standard Weight Set	Class E2	B746971965	C02203624	02 Oct 2022

Traceability

This certification is traceable to the International System of Unit maintained at :
SPC - SPC Calibration Center Co;Ltd.



Result of Calibration

Certificate No. : SPR21120343-1

Page : 3 of 3

Range capacity : 0 to 220 g

Resolution: 0.0001 g

Repeatability (n = 10 number of measurement)

Standard Weight (g)	Standard Deviation
200	0.0000

Departure of indication from nominal Value

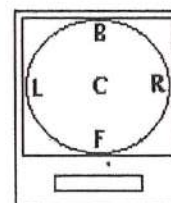
Unit : g

Nominal Value	UUC Reading	Error	Uncertainty (±)
No Load	0.0000	0.0000	0.000058
1.0	1.0000	0.0000	0.000059
5.0	5.0000	0.0000	0.000064
10.0	10.0000	0.0000	0.000064
20.0	20.0000	0.0000	0.000073
40.0	40.0000	0.0000	0.000080
60.0	59.9999	-0.0001	0.00011
80.0	79.9999	-0.0001	0.00016
100.0	100.0000	0.0000	0.00016
150.0	149.9999	-0.0001	0.00020
200.0	199.9998	-0.0002	0.00030

Off - Center Loading

Center	49.9999 g
Front	50.0002 g
Back	49.9997 g
Left	50.0001 g
Right	49.9997 g
Maximum difference	0.0003 g

A mass of 50 g was placed to various positions on the pan. The weighing machine reading error obtained is given in table.



Note:

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

Measurement Uncertainty

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

- End of Certificate -

SP-FM-04-15 REV.0

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E06NI99E15A0003
Cylinder Number: EB0128769
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12019
Gas Code: CH₄,CO,NO,NO_x,SO₂,BALN

Reference Number: 160-401615777-1
Cylinder Volume: 144.4 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Oct 29, 2019

Expiration Date: Oct 29, 2027

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	55.00 PPM	57.03 PPM	G1	+/- 0.8% NIST Traceable	10/22/2019, 10/29/2019
NITRIC OXIDE	55.00 PPM	57.03 PPM	G1	+/- 0.8% NIST Traceable	10/22/2019, 10/29/2019
SULFUR DIOXIDE	55.00 PPM	57.38 PPM	G1	+/- 0.9% NIST Traceable	10/22/2019, 10/29/2019
METHANE	180.0 PPM	181.2 PPM	G1	+/- 0.9% NIST Traceable	10/22/2019
PROPANE	180.0 PPM	181.6 PPM	G1	+/- 0.9% NIST Traceable	10/22/2019
CARBON MONOXIDE	4500 PPM	4564 PPM	G1	+/- 0.6% NIST Traceable	10/22/2019
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13010429	KAL004123	97.6 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Jul 23, 2025
NTRM	13010429	KAL004123	97.6 PPM NO _x /NITROGEN	+/- 0.8%	Jul 23, 2025
NTRM	16010235	KAL004419	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 23, 2021
NTRM	08011503	K002564	246.7 PPM METHANE/AIR	+/- 0.6%	May 15, 2025
NTRM	01010309	K011475	499.3 PPM PROPANE/AIR	0.60	Jul 02, 2024
NTRM	072508	KAL004522	970.0 PPM CARBON MONOXIDE/NITROGEN	0.36%	May 14, 2021

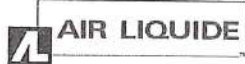
ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
MKS FTIR - CO - 000928781	FTIR	Sep 26, 2019
MKS FTIR CH ₄ 000929060	FTIR	Sep 30, 2019
MKS FTIR - NO - 000928781	FTIR	Oct 18, 2019
MKS FTIR - NO _x - 000928781	FTIR	Oct 18, 2019
MKS FTIR C ₃ H ₈ 000929060	FTIR	Oct 18, 2019
MKS FTIR - SO ₂ - 000928781	FTIR	Oct 03, 2019

Triad Data Available Upon Request

NOTES: Gross Weight: 28.9 Kg, Net Weight: 4.7 Kg.



Mark A. Linder
Approved for Release



Air Liquide America
Specialty Gases LLC



RATA CLASS

Guaranteed +/- 1% Accuracy

1290 COMBERMERE STREET, TROY, MI 48083

Phone: 248-589-2950

Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory - PGVP Vendor ID: A22014

AIR LIQUIDE AMERICA SPECIALTY GASES LLC P.O. No.: 12141092 R.1
1290 COMBERMERE STREET Document #: 55057749-003
TROY, MI 48083

Customer

AIR LIQUIDE THAILAND LTD
MONNIPA WONGANU/PO 121410
849, 14/F VORAWAT BLDG, U
SILOM ROAD, BANGRAK
10500 BANGKOK
THAILAND

ANALYTICAL INFORMATION Gas Type : NONE

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1, EPA/600/R-12/531; May 2012. Do not use this standard if pressure is less than 100 psig.

Cylinder Number: CC441324 Certification Date: 23May2014 Exp. Date: 24May2022
Cylinder Pressure: 2000 PSIG Batch No: TRO0110103

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ACCURACY (ABSOLUTE / RELATIVE)	
METHANE	180	PPM	1.	PPM / 0.8 %
PROPANE	181	PPM	1.	PPM / 0.6 %
AIR	BALANCE			

TRACEABILITY

REFERENCE STANDARD

COMPONENT	CONCENTRATION	UNCERTAINTY	CYLINDER	TYPE/SRM SAMPLE	EXP. DATE
METHANE	1001.0000 PPM	7.0000 PPM	K017937	NTRM 1000	18Jul2017
PROPANE	98.8000 PPM	0.6000 PPM	ALM038653	NTRM 166B	12Jul2018

ANALYTICAL METHOD

1st Analysis: 23May2014

COMPONENT	INSTRUMENT	ANALYTICAL/PRINCIPLE	CALIBRATED	CONCENTRATION
METHANE	VARIAN/3400/7506	TCD/FID	05May2014	180.0 PPM
PROPANE	VARIAN/3400/7506	TCD/FID	19May2014	181.0 PPM

Special Notes:

MPT QUOTE 0119813001 CGA 590 BR TARE WEIGHT : 23.01 KG
GROSS WEIGHT : 27.45 KG NET WEIGHT : 4.835 KG

APPROVED BY:

ROBERT LESNIAK



บริษัท เอ็นไวโรโปร จำกัด

ENVIRPRO CO., LTD.

168/28 ถนนลาดพร้าว แขวงลาดพร้าว เขตลาดพร้าว กรุงเทพฯ 10230

168/28 Nakniwas Rd., Ladprao, Bangkok 10230

Tel. 02-5300284 , 02-5300331 Fax. Ext. 18 Website : www.envirprothailand.com

Calibration Data of CO Analyzer

Analyzer Performance Test

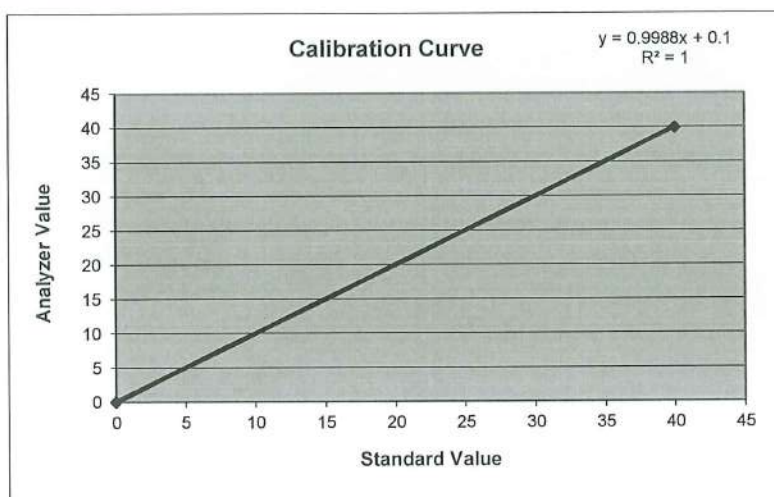
Analyzer Type	CO	Customer Name	โครงการ LLOYD SOONVIJAI-THONGLOR
Manufacture	API	Location	ซอยเพชรบุรี 47 แยก 3 ถนนเพชรบุรีตัดใหม่ แขวงบางกะปิ เขตห้วยขวาง กรุงเทพมหานคร
Model	300E		
Serial NO.	1001	Techician	Mr.Thawat
Analyzer Unit	ppm	Date	27 June 2022

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value		Stability		% Abs Error
		CO (ppm)				
		Before	After	Before	After	
Zero	0	0.09	0.01	0.02	0.02	-
Span	40	39.44	39.96	0.02	0.02	0.1

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	111-57025-313
Dynamic Dilution Calibrator	Teledyne API	700	1184
Standard gas Components	CO = 4,564 ppm NO = 57.03 ppm SO ₂ = 57.38 ppm		



Weratip G.

Calibrated by	Mr.Thawat	Approved by	Mr. Weratep G.
Position	Environmental Officer	Position	Environmental Engineer (ว-156-ก-3424)
Date	27 June 2022	Date	27 June 2022



บริษัท เอ็นไวรโพร จำกัด

ENVIRPRO CO., LTD.

168/28 ถนนลาดพร้าว แขวงลาดพร้าว เขตลาดพร้าว กรุงเทพฯ 10230

168/28 Nakniwas Rd., Ladprao, Bangkok 10230

Tel. 02-5300284 , 02-5300331 Fax. Ext. 18 Website : www.envirprothailand.com

Calibration Data of CO Analyzer

Analyzer Performance Test

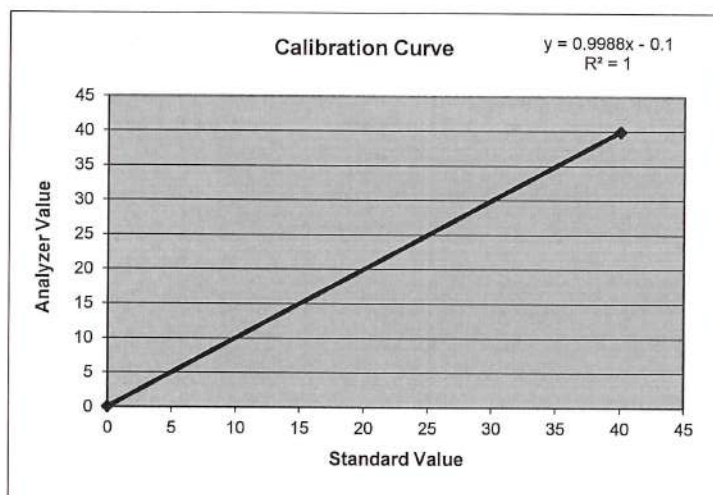
Analyzer Type	CO	Customer Name	โครงการ LLOYD SOONVIJAI-THONGLOR
Manufacture	API	Location	ซอยเพชรบุรี 47 แยก 3 ถนนเพชรบุรีตัดใหม่ แขวงบางกะปิ
Model	300E		เขตห้วยขวาง กรุงเทพมหานคร
Serial NO.	1839	Technician	Mr.Thawat
Analyzer Unit	ppm	Date	27 June 2022

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value		Stability		% Abs Error
		CO (ppm)				
		Before	After	Before	After	
Zero	0	0.09	0.01	0.02	0.01	-
Span	40	39.44	39.96	0.03	0.01	-0.1

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	111-57025-313
Dynamic Dilution Calibrator	Teledyne API	700	1184
Standard gas Components	CO = 4,564 ppm NO = 57.03 ppm SO ₂ = 57.38 ppm		



Am

Calibrated by	Mr.Thawat	Approved by	Mr. Weratep G.
Position	Environmental Officer	Position	Environmental Engineer (ว-156-ค-3424)
Date	27 June 2022	Date	27 June 2022



บริษัท เอ็นไวรโพร จำกัด

ENVIRPRO CO., LTD.

168/28 ถนนลาดพร้าว แขวงลาดพร้าว เขตลาดพร้าว กรุงเทพฯ 10230

168/28 Nakniwas Rd., Ladprao, Bangkok 10230

Tel. 02-5300284 , 02-5300331 Fax. Ext. 18 Website : www.envirprothailand.com

Calibration Data of NO₂ Analyzer

Analyzer Performance Test

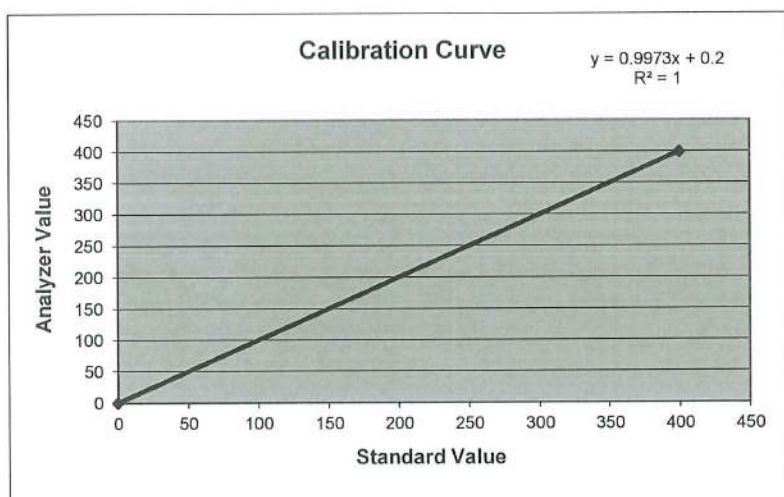
Analyzer Type	NO _x	Customer Name	โครงการ LLOYD SOONVIJAI-THONGLOR
Manufacture	API	Location	ซอยเพชรบุรี 47 แยก 3 ถนนเพชรบุรีตัดใหม่ แขวงบางกะปิ เขตห้วยขวาง กรุงเทพมหานคร
Model	200E		
Serial NO.	174	Technician	Mr.Thawat
Analyzer Unit	ppb	Date	27 June 2022

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs NO Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	-0.3	0.1	-1.6	0.2	1.3	-0.1	0.2	0.1	-
Span	400	411.1	401.1	405.5	399.1	5.6	2.0	0.3	0.1	0.225

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	111-57025-313
Dynamic Dilution Caribrator	Teledyne API	700	1184
Standard gas Components	CO = 4,564 ppm NO = 57.03 ppm SO ₂ = 57.38 ppm		



Am

Calibrated by	Mr.Thawat	Approved by	Mr. Weratep G.
Position	Environmental Officer	Position	Environmental Engineer (ว-156-ค-3424)
Date	27 June 2022	Date	27 June 2022



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168/28 Nakniwas Rd., Ladprao, Bangkok 10230

Tel. 02-5300284, 02-5300331 Fax. Ext. 18 Website : www.envirprothailand.com

Calibration Data of NO₂ Analyzer

Analyzer Performance Test

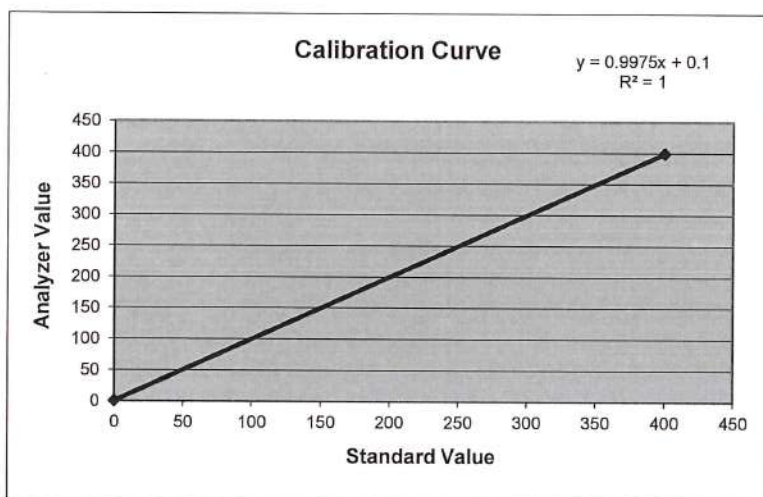
Analyzer Type	NO _x	Customer Name	โครงการ LLOYD SOONVIJAI-THONGLOR
Manufacture	API	Location	ซอยเพชรบุรี 47 แยก 3 ถนนเพชรบุรีตัดใหม่ แขวงบางกะปิ เขตห้วยขวาง กรุงเทพมหานคร
Model	200E		
Serial NO.	214	Technician	Mr.Thawat
Analyzer Unit	ppb	Date	27 June 2022

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs NO Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	1.4	0.8	-0.2	0.5	1.6	0.3	0.4	0.1	-
Span	400	412.6	401.9	411.5	399.5	1.1	2.4	0.3	0.1	0.125

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	111-57025-313
Dynamic Dilution Calibrator	Teledyne API	700	1184
Standard gas Components	CO = 4,564 ppm NO = 57.03 ppm SO ₂ = 57.38 ppm		



Am

Calibrated by	Mr.Thawat	Approved by	Mr. Weratep G.
Position	Environmental Officer	Position	Environmental Engineer (ว-156-ค-3424)
Date	27 June 2022	Date	27 June 2022



บริษัท เอ็นไวรโพร จำกัด

ENVIRPRO CO., LTD.

168/28 ถนนพญาไท แขวงลาดพร้าว เขตลาดพร้าว กรุงเทพฯ 10230

168/28 Nakniwas Rd., Ladprao, Bangkok 10230

Tel. 02-5300284 , 02-5300331 Fax. Ext. 18 Website : www.envirprothailand.com

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

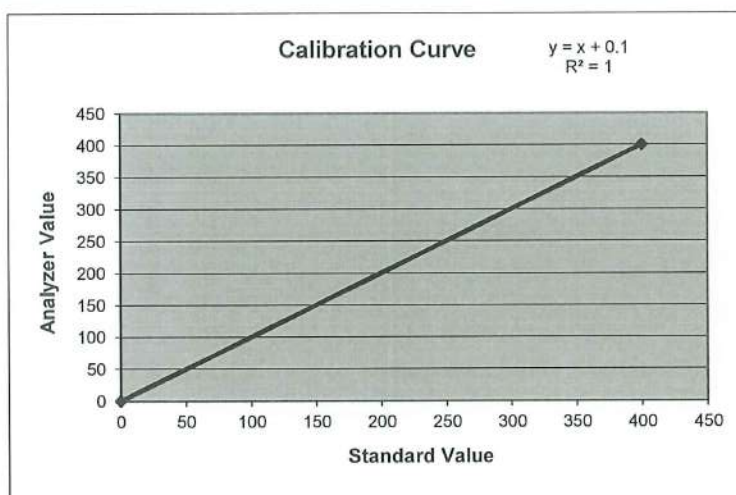
Analyzer Type	SO ₂	Customer Name	โครงการ LLOYD SOONVIJAI-THONGLOR
Manufacture	API	Location	ซอยเพชรบุรี 47 แยก 3 ถนนเพชรบุรีตัดใหม่ แขวงบางกะปิ เขตห้วยขวาง กรุงเทพมหานคร
Model	100A		
Serial NO.	1814	Technician	Mr.Thawat
Analyzer Unit	ppb	Date	27 June 2022

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppb)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	0.4	0.1	0.2	0.2	-
Span	400	402.4	400.1	0.5	0.5	0.025

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	111-57025-313
Dynamic Dilution Caribrator	Teledyne API	700	1184
Standard gas Components	CO = 4,564 ppm NO = 57.03 ppm SO ₂ = 57.38 ppm		



Weratip G.

Calibrated by	Mr.Thawat	Approved by	Mr. Weratep G.
Position	Environmental Officer	Position	Environmental Engineer (ว-156-ค-3424)
Date	27 June 2022	Date	27 June 2022



บริษัท เอ็นไวรโพร จำกัด

ENVIRPRO CO., LTD.

168/28 ถนนนิเวศ แขวงลาดพร้าว เขตลาดพร้าว กรุงเทพฯ 10230

168/28 Nakniwas Rd., Ladprao, Bangkok 10230

Tel. 02-5300284 , 02-5300331 Fax. Ext. 18 Website : www.envirprothailand.com

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

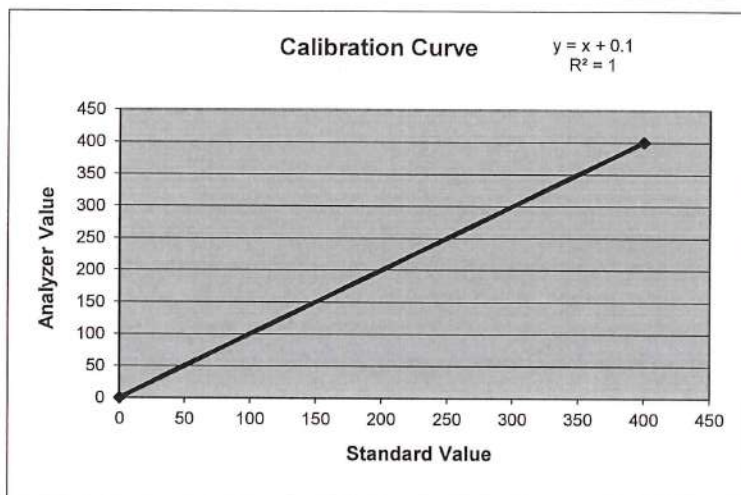
Analyzer Type	SO ₂	Customer Name	โครงการ LLOYD SOONVIJAI-THONGLOR
Manufacture	API	Location	ซอยเพชรบุรี 47 แยก 3 ถนนเพชรบุรีตัดใหม่ แขวงบางกะปิ เขตห้วยขวาง กรุงเทพมหานคร
Model	100A		
Serial NO.	1894	Technician	Mr.Thawat
Analyzer Unit	ppb	Date	27 June 2022

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppb)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	0.4	0.1	0.2	0.2	-
Span	400	402.4	400.1	0.5	0.5	0.025

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	111-57025-313
Dynamic Dilution Carlibrator	Teledyne API	700	1184
Standard gas Components	CO = 4,564 ppm NO = 57.03 ppm SO ₂ = 57.38 ppm		



Weratup G.

Calibrated by	Mr.Thawat	Approved by	Mr. Weratep G.
Position	Environmental Officer	Position	Environmental Engineer (ว-156-ค-3424)
Date	27 June 2022	Date	27 June 2022

ภาคผนวกที่ 5.2

เอกสารสอบเทียบเครื่องมือตรวจวัดระดับเสียงทั่วไป



Certificate of Calibration

Certificate Number : SPR22020020-22

Page : 1 of 3

Customer : ENVIRPRO CO.,LTD.

168/28 Nakniwas Rd., Ladprao, Bangkok 10230

Equipment Name : Sound Calibrator

Manufacturer : Tenmars

Model : TM-100

Serial Number : 210502635

ID. Number : N/A

Environmental Conditions

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

Received Date : 02 Feb 2022

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

Calibration Date : 02 Feb 2022

Location of Calibration : In-Lab

Recommend Due Date : N/A

Calibration Procedure : In-House Method

Date of Issue : 03 Feb 2022

Method of Calibration

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

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

Calibrated by : Mr.Chumpon Dokpikul

Approved by :

Calibration Officer

(Mr.Worapong Sinthusopa)

Authorized Signatory



Calibration Report

Certificate Number : SPR22020020-22

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Measuring Receiver	8902A	2950A02471	EF-0001-21	28 Feb 2022
AUDIO Analyzer	8903B	3011A09975	EL04965/21	19 Feb 2022

Traceability

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

NIMT - The National Institute of Metrology, Thailand.

PCAL - Professional Calibration & Services Co.,Ltd



Result of Calibration

Certificate No. : SPR22020020-22

Page : 3 of 3

Function : Sound Level

UUC Setting (\pm dB)	Standard Reading (dB)	Error (dB)	Uncertainty (\pm dB)
94	93.92	0.08	1.5
114	113.97	0.03	1.5

Note:

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

Measurement Uncertainty

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

- End of Certificate -



บริษัท เอ็นไวรโพร จำกัด

ENVIRPRO CO., LTD.

168/28 ถนนลาดพร้าว แขวงลาดพร้าว เขตลาดพร้าว กรุงเทพฯ 10230

168/28 Nakniwas Road, Ladprao, Bangkok 10230 www.envirprothailand.com

Calibration Data of Integrating Sound Level Meter

Sound Level Meter

Equipment	Integrating Sound Level Meter	Customer Name	โครงการ LLOYD SOONVIJAI-THONGLOR
Manufacture	ACO	Location	ซอยเพชรบุรี 47 แยก 3 ถนนเพชรบุรีตัดใหม่ แขวงบางกะปิ
Model	6226		เขตห้วยขวาง กรุงเทพมหานคร
Serial NO.	190043	Technician	Mr.Thawat
SLM Unit	dB	Date	27 June 2022

Sound Calibrator

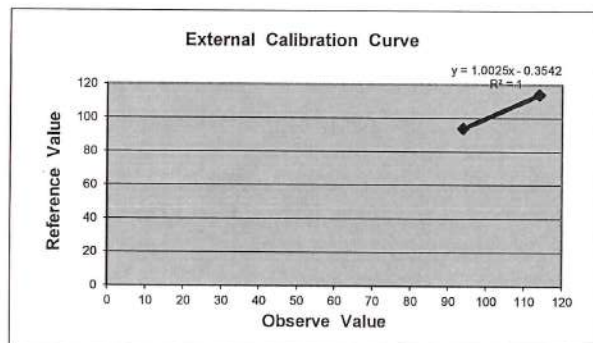
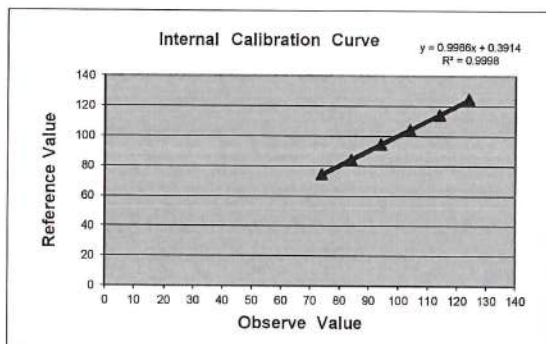
Equipment	Sound Calibrator	Certificated by	SP METROLOGY SYSTEM (THAILAND) CO.,LTD.
Manufacture	TENMARS	Location	69/29 Moo 1 Klongsi Klongluang
Model	TM-100		Pathumthani 12120 (Thailand)
Serial NO.	2061831	Calibration Date	2 February 2022
Unit	dB	Expire Date	2 February 2023

Internal Calibration

Range (dB)	Reference Value	Observe Value	% Abs Error	Different Value
20-80	74.0	74.5	0.7	0.5
20-90	84.0	84.0	0.0	0.0
20-100	94.0	94.5	0.5	0.5
20-110	104.0	104.0	0.0	0.0
30-120	114.0	114.0	0.0	0.0
40-130	124.0	124.5	0.4	0.5

External Calibration

Level (dB)	Reference Value	Observe Value	% Abs Error	Different Value	Adjust Value
94	93.92	93.8	0.1	0.1	2.0
114	113.97	113.9	0.1	0.1	-



Calibrated by	Mr.Thawat	Approved by	Mr. Weratep
Date	27 June 2022	Date	27 June 2022



Weratep



บริษัท เอ็นไวรโอพร จำกัด

ENVIRPRO CO., LTD.

168/28 ถนนลาดพร้าว แขวงลาดพร้าว เขตลาดพร้าว กรุงเทพฯ 10230

168/28 Nakniwas Road, Ladprao, Bangkok 10230 www.envirprothailand.com

Calibration Data of Integrating Sound Level Meter

Sound Level Meter

Equipment	Integrating Sound Level Meter	Customer Name	โครงการ LLOYD SOONVIJAI-THONGLOR
Manufacture	ACO	Location	ซอยเพชรบุรี 47 แยก 3 ถนนเพชรบุรีตัดใหม่ แขวงบางกะปิ
Model	6226		เขตห้วยขวาง กรุงเทพมหานคร
Serial NO.	190048	Technician	Mr.Thawat
SLM Unit	dB	Date	27 June 2022

Sound Calibrator

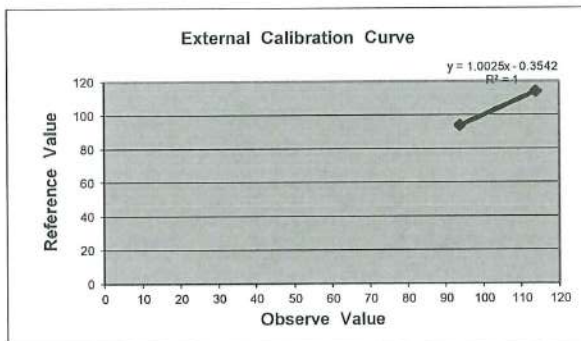
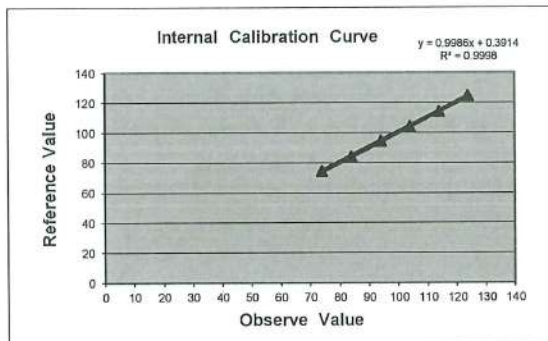
Equipment	Sound Calibrator	Certificated by	SP METROLOGY SYSTEM (THAILAND) CO.,LTD.
Manufacture	TENMARS	Location	69/29 Moo 1 Klongsi Klongluang
Model	TM-100		Pathumthani 12120 (Thailand)
Serial NO.	2061831	Calibration Date	2 February 2022
Unit	dB	Expire Date	2 February 2023

Internal Calibration

Range (dB)	Reference Value	Observe Value	% Abs Error	Different Value
20-80	74.0	74.5	0.7	0.5
20-90	84.0	84.0	0.0	0.0
20-100	94.0	94.5	0.5	0.5
20-110	104.0	104.0	0.0	0.0
30-120	114.0	114.0	0.0	0.0
40-130	124.0	124.5	0.4	0.5

External Calibration

Level (dB)	Reference Value	Observe Value	% Abs Error	Different Value	Adjust Value
94	93.92	93.8	0.1	0.1	2.0
114	113.97	113.9	0.1	0.1	-



Calibrated by	Mr.Thawat	Approved by	Mr. Weratep
Date	27 June 2022	Date	27 June 2022



Weratep

ภาคผนวกที่ 5.3

เอกสารสอบเทียบเครื่องมือตรวจวัดความสั่นสะเทือน

Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM16194

Calibration Date: DEC 27 2019

Calibration Reference Equipment: 714J7402

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

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

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

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

Calibrated By: _____



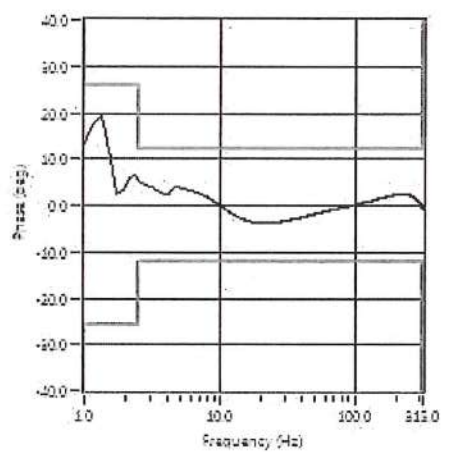
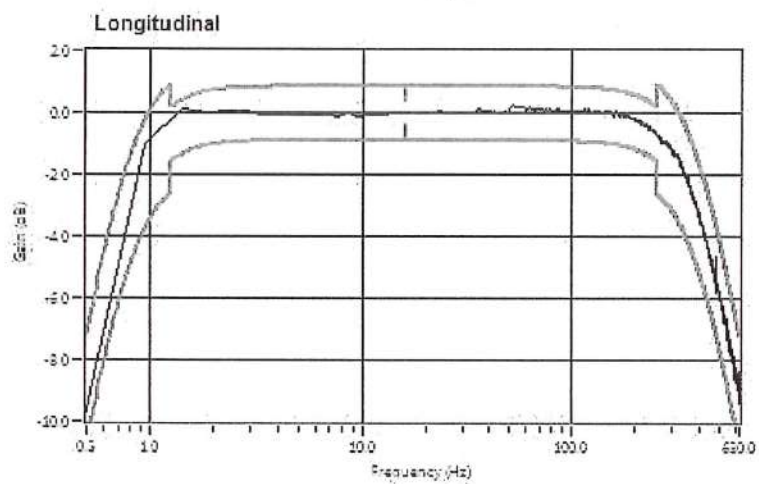
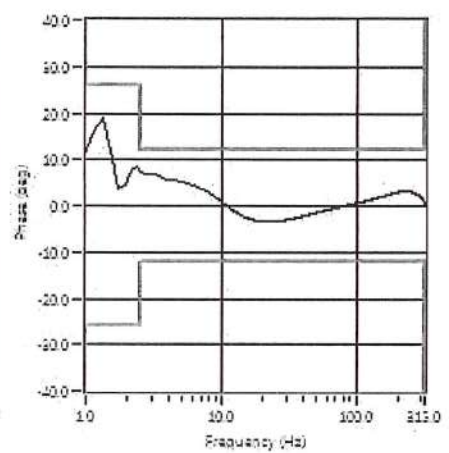
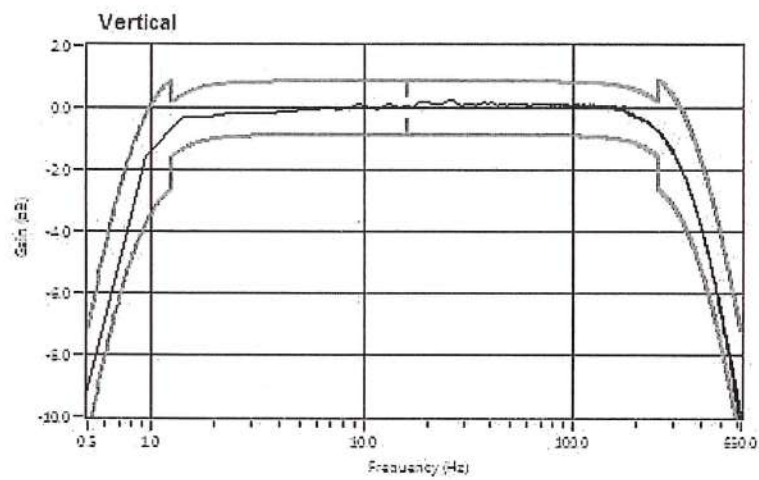
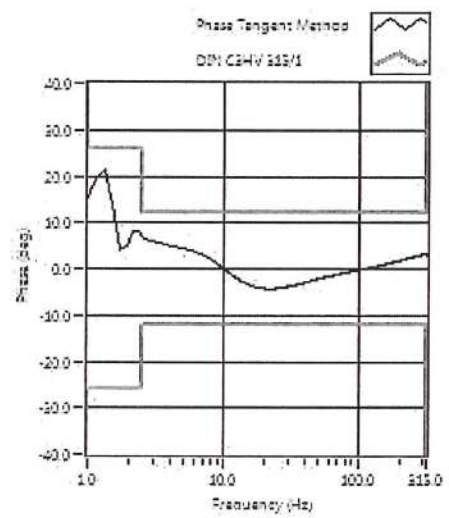
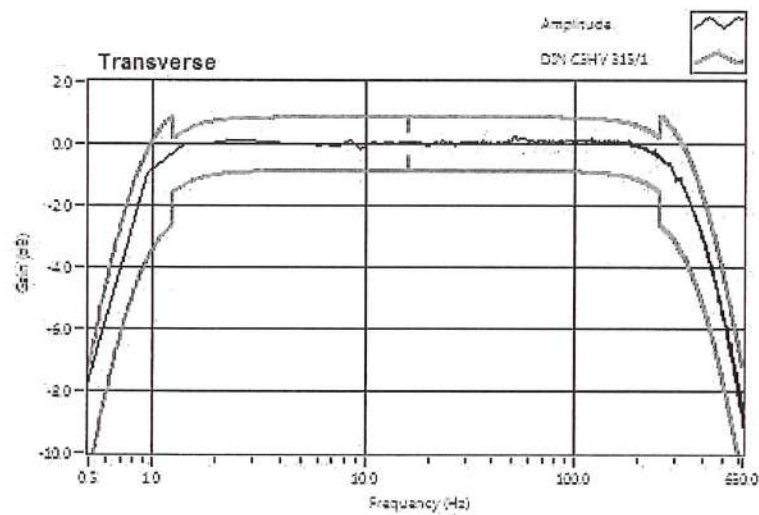
Xiaoming Yang



Instantel®

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

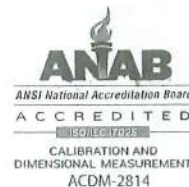
Frequency Response of UM16194





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 : VIBRATION METER
MANUFACTURER : INSTANTEL
MODEL / TYPE : MICROMATE
SERIAL NO. : UM16260/UM16194
CLID. NO. : 252002479
JOB CONTROL NO. : 201215111228

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

DATE OF RECEIVED : 15 December 2020

DATE OF ISSUED : 18 December 2020

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

Calibrated By : Suwit Phuanbusabong
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
18 December 2020



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. Q20111228

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	:	VIBRATION METER
MANUFACTURER	:	INSTANTEL
MODEL / TYPE	:	MICROMATE
SERIAL NO.	:	UM16260/UM16194
DATE OF CALIBRATION	:	16 December 2020

ENVIRONMENT CONDITIONS :

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

Relative Humidity : $(55 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPEE-08** according to **ISO 16063-21** as calibration guideline. The calibration was performed by calibrated by comparison method and standard equipments maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Digital Multimeter, Agilent Technologies Model 34401A S/N. US36044686.
2. Arbitrary Waveform Generator, Agilent Model 33120A S/N.US36046664.
3. Accelerometer with Precision Conditioning Amplifier, Bruel & Kjaer Model 8305, 2650 S/N. 705491, 701615.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EE-0097-20, Due Date 14 June 2021.
2. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. EF-0015-20, Due Date 28 February 2022.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0044-20, Due Date 17 September 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. **Q20111228**

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 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

CALIBRATION DATA

VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	\pm (% of rdg.)
10	160 Hz	peak	10.000	10.426	-0.426	1.8
20	160 Hz		20.000	20.533	-0.533	1.8
30	160 Hz		30.000	30.621	-0.621	1.0

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 005 Page 1 of 45

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

End of Certificate

Certificate No. Q20111228

F3-011-04/01-12

page 3 of 3



@clccalibration

ภาคผนวกที่ 5.4

เอกสารสอบเทียบเครื่องมือตรวจวัดคุณภาพน้ำ



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 ± 2.5) °C , Relative Humidity (50 ± 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 :


for (Ms.Kirana Luchairun)
Director


(Ms.Phlapphlueng 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.BL.MTC.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

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



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)

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.: 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

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 (± 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 (± 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

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	Model	i250DS
Manufacturer	ACCUPLUS	ID No.	SV-TL.030/2553
Serial No.	I250402-0510-0315		
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)

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.: T1-0607003/21

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

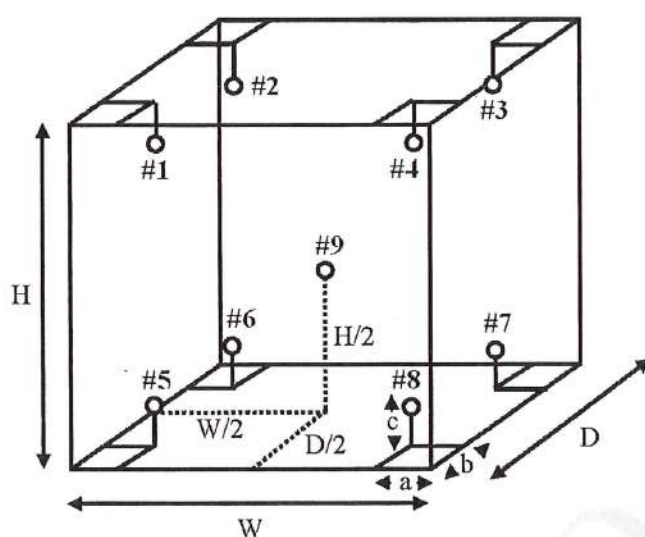
Calibrated by Pichet

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 -

Calibrated by Pichet



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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

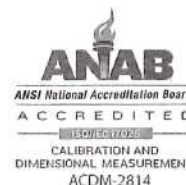


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REPORT OF CALIBRATION

FOR

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

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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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



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CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : ELECTRONIC BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL / TYPE : AG285
SERIAL NO. : 1122140125[SV-TL.005/2546]
CLID. NO. : 361602065
JOB CONTROL NO. : 201102096805

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

DATE OF RECEIVED : 02 November 2020

DATE OF ISSUED : 11 November 2020

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

Calibrated By : Mangkornchai Lungkratok
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
11 November 2020



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. Q20096805

F3-011-04/01-12

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REPORT OF CALIBRATION FOR

NOMENCLATURE : ELECTRONIC BALANCE
MANUFACTURER : METTLER TOLEDO
MODEL / TYPE : AG285
SERIAL NO. : 1122140125[SV-TL.005/2546]
LOCATION SITE : CALIBRATION ROOM
DATE OF CALIBRATION : 06 November 2020

ENVIRONMENT CONDITIONS :

Temperature : 23 °C to 24 °C

Relative Humidity : 48 % to 49 %

PROCEDURE USED :

This instrument was calibrated under procedure No. WI-305-46 based on EURAMET/cg-18/Version 4.0 (11/2015).

The calibration was performed by using Weight Set which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Weight Set Mettler Toledo Class E2 S/N. 158850.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand).

Certificate No. MM-0182-19, Due Date 16 December 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. Q20096805

F3-011-04/01-12

page 2 of 4



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NSC-TISI-TIS 17025
CALIBRATION 0059
CLC

CONDITION OF CALIBRATION ITEM : GOOD

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

1. Error of indications

Nominal Test Value (g)	Conventional mass (g)	Display Value (g)	Error of Balance (g)	Uncertainty \pm (mg)	Coverage factor k
0.00100	0.00100	0.00104	+0.00004	0.105	2,00
0.00300	0.00300	0.00307	+0.00007	0.105	2,00
0.00500	0.00500	0.00497	-0.00003	0.105	2,00
0.01000	0.01000	0.01006	+0.00006	0.105	2,00
0.05000	0.05000	0.05000	0.00000	0.105	2,00
0.10000	0.10000	0.10001	+0.00001	0.106	2,00
0.50000	0.50000	0.50003	+0.00003	0.106	2,00
1.00000	1.00000	1.00002	+0.00002	0.106	2,00
10.00000	9.99998	9.99998	0.00000	0.110	2,00
20.00000	20.00003	20.00008	+0.00005	0.114	2,00
30.00000	30.00000	30.00004	+0.00004	0.131	2,00
40.00000	40.00004	40.00002	-0.00002	0.140	2,00
50.00000	49.99998	49.99999	+0.00001	0.131	2,00
60.00000	59.99996	59.99995	-0.00001	0.151	2,00
70.00000	70.00001	69.99997	-0.00004	0.162	2,00
80.00000	79.99998	79.99995	-0.00003	0.187	2,00
85.0000	85.0000	85.0000	0.0000	0.23	2,00
90.0000	90.0000	90.0000	0.0000	0.22	2,00
100.0000	100.0000	100.0000	0.0000	0.19	2,00
110.0000	110.0000	110.0000	0.0000	0.22	2,00
120.0000	120.0000	120.0000	0.0000	0.22	2,00
130.0000	130.0000	130.0000	0.0000	0.25	2,00
140.0000	140.0000	140.0000	0.0000	0.26	2,00
150.0000	150.0000	149.9999	-0.0001	0.25	2,00
160.0000	159.9999	160.0000	+0.0001	0.28	2,00
170.0000	170.0000	170.0001	+0.0001	0.29	2,00
180.0000	180.0000	180.0001	+0.0001	0.32	2,00
190.0000	190.0000	190.0002	+0.0002	0.33	2,00
200.0000	199.9997	200.0002	+0.0005	0.28	2,00

Certificate No. Q20096805

F3-011-04/01-12

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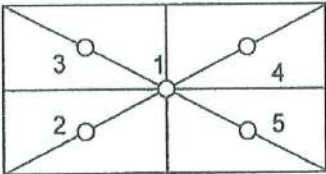
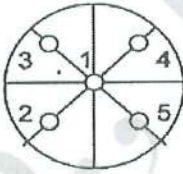
@clccalibration

CALIBRATION DATA

2. Repeatability of indications

Nominal Test Value (g)	Standard Deviation of Reading (g)
50.00000	0.000009
200.0000	0.00007

3. Effect of eccentric application of a load on the indication

<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <input type="checkbox"/>  </div> <div style="text-align: center;"> <input checked="" type="checkbox"/>  </div> </div>						
Nominal Test Value (g)	Display Value (g)					Maximum Difference of Center Value (g)
	Position 1	Position 2	Position 3	Position 4	Position 5	
50.00000	49.99997	49.99993	50.00008	49.99998	49.99979	0.00018

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

End of Certificate

Certificate No. Q20096805

F3-011-04/01-12

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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

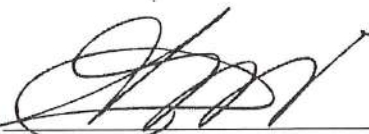
Date of Issue 7 July 2021

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	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: (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

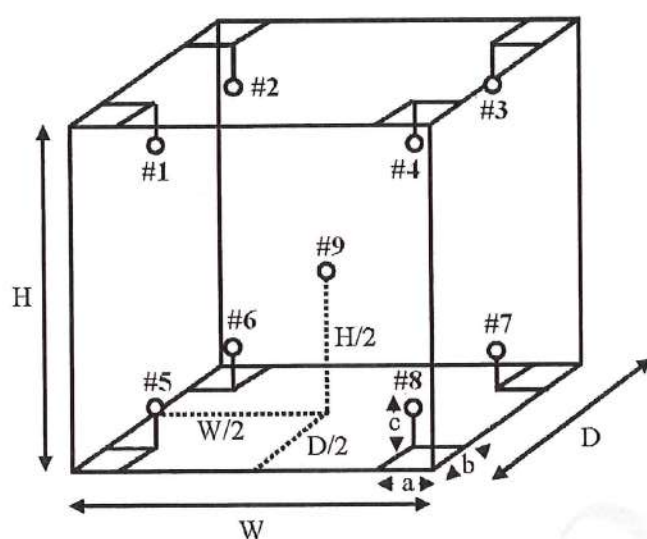
REV.02 02/24/21

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 -



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 : 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



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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[®] 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

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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

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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



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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



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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 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

page 3 of 3



@clccalibration

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	Model	DKL 12
Manufacturer	VELP SCIENTIFICE	ID No.	SV-TL.084/2561
Serial No.	465101		
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

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

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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

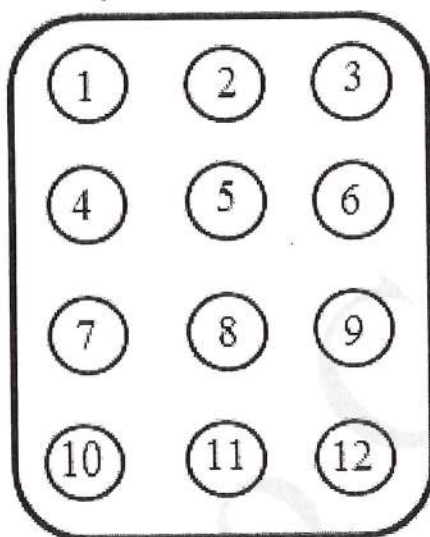
Calibrated by

Pichet

Certificate No.: T1-0607005/21

Page 4 of total 4 pages

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 -



MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

AAAnalyst 200/400

Customer : บริษัท เ็นไวโรปอร์ จำกัด Address : 168/28 ถ.นาคนิเวาส แขวงลาดพร้าว เขตลาดพร้าว กรุงเทพฯ 10230 User Name: คุณนาวิกา Phone: 02-5300284-5 Email: mlm_panda@hotmail.com	Date Tested: August 4, 2021 Recommendation Recertification Period 6 Months Recertification Due: February 4, 2022 Date Last Certified: February 4, 2021 Visit Number: 2 of 2 PerkinElmer Phone: 02-719-6420 ext 203 PerkinElmer Fax: 02-318-5597
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CONFIGURATION TESTED		
MODEL	SERIAL NUMBER	SOFTWARE
AAAnalyst 200	201S5082209	AA WinLab32 Version 6.5
FIAS 100	100S3020504	
TEST STANDARD USED	PART NUMBER	EXPIRATION DATE
Copper	N9300183	January 30, 2022
Nickel	N9300244	September 20, 2021
MG0-135	N101-3000	
MG2-462	N101-3002	



MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

AAAnalyst 200/400

SERIAL NUMBER	<u>201S5082209</u>	DATE TESTED	<u>4 August 2021</u>
1. INSTRUMENT CHECKS			
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
2. GAS SYSTEM CHECKS			
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"/> N/A
C. Inspect the air cartridge filter. (Replacement cartridge filter every 6 months)			<input type="checkbox"/> OK
3. ELECTRICAL			
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
4. FIAS CHECKS			
A. Pump and 5 Port Valve			<input type="checkbox"/> N/A
B. Chemifold and Tubing			<input type="checkbox"/> N/A
C. Power Supply			<input type="checkbox"/> N/A
D. Flow meter and Gas system			<input type="checkbox"/> N/A



MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

AAAnalyst 200/400

SERIAL NUMBER	201S5082209		DATE TESTED	4 August 2021	
PARAMETER	SPECIFICATION		ACTUAL VAULE		
5. PERFORMANCE TESTS					
1. Detector-Linearity with Barium (553.55 nm).					
Neutral Density Filter 0.2 Abs:	0.1922 Abs. \pm 5%		0.1863 Abs.		
Neutral Density Filter 1.0 Abs:	1.0154 Abs. \pm 5%		1.0438 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.		0.0023 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.		0.0002 Abs.		
4. D ₂ Background Compensation (Copper 324.75 nm).					
with Neutral Density Filter 1.0	Absorbance \leq 0.010 Abs		-0.0077 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.		0.0007 Abs.		
6. Flame Safety Interlock all Functions.					
				<input type="checkbox"/> OK	

MAINTENANCE REPORT AND CALIBRATION CERTIFICATE

ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL

AAAnalyst 200/400

SERIAL NUMBER <u>201S5082209</u>		DATE TESTED <u>4 August 2021</u>
PARAMETER	SPECIFICATION	ACTUAL VAULE
7. Wavelength Accuracy with Nickel (232.00 nm).		
Nickel Prism Position	± 190 steps	<u>- 49</u> Steps
Nickel Grating Position	$+ 380, - 260$ steps	<u>+ 80</u> Steps
3 mg/L Ni Standard Mean Abs	≥ 0.200 Abs	<u>0.309</u> Abs.
8. Flame Sensitivity with Copper (324.75 nm).		
Cu Prism Position	± 120	<u>- 68</u> Steps
Cu Grating Position	± 380	<u>+ 96</u> Steps
(2 mg/L Cu Standard at an integration time of 10 seconds and 10 replicates)		
Mean Absorbance	≥ 0.250	<u>0.404</u> Abs.
Capacitance value	≥ 1.0 pF	<u>3.5</u> pF

MAINTENANCE REPORT AND CALIBRATION CERTIFICATE**ATOMIC ABSORPTION SPECTROPHOTOMETER MODEL****AAAnalyst 200/400****SERIAL NUMBER** 201S5082209**DATE TESTED** 4 August 2021

Remarks :

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



meets

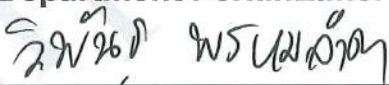


does not meet

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:



(Wiphan Promlumda)

Service Engineer

PerkinElmer Pure

Atomic Spectroscopy Standard



Certificate of Analysis

PerkinElmer Number: N9300244
Description: GFAAS Mixed Standard
Matrix: 5% HNO₃ / Tr. HF / Tr. Tart. Acid
Lot Number: 53-255CRY1

Certification Date: MAR - - 2020

Expiration Date: SEP 30 2021

* Instrumental Analysis using OPTIMA 7300 DV ICP Spectrometer:

Analyte	Labeled	Measured	SRM	Analyte	Labeled	Measured	SRM
Al	100 µg/mL	100 µg/mL	3101a*	Cu	50.0 µg/mL	50.0 µg/mL	3114*
As	100 µg/mL	99.2 µg/mL	3103a*	Ni	50.0 µg/mL	50.3 µg/mL	3136*
Pb	100 µg/mL	100 µg/mL	3128*	Cr	20.0 µg/mL	20.2 µg/mL	3112a*
Sb	100 µg/mL	98.7 µg/mL	3102a*	Fe	20.0 µg/mL	20.0 µg/mL	3126a*
Se	100 µg/mL	98.7 µg/mL	3149*	Mn	20.0 µg/mL	20.2 µg/mL	3132*
Tl	100 µg/mL	99.8 µg/mL	3158*	Ag	10.0 µg/mL	9.92 µg/mL	3151*
Ba	50.0 µg/mL	49.6 µg/mL	3104a*	Be	5.00 µg/mL	4.93 µg/mL	3105a*
Co	50.0 µg/mL	50.0 µg/mL	3113*	Cd	5.00 µg/mL	5.02 µg/mL	3108*

* - indicates NIST SRM

† - indicates CRM (when NIST SRM is not available)

Reference Multi: Lot# 49-211CR, 1-030MF

Refer to side 2 for details of certification.

Balances are calibrated with weight sets traceable to NIST.

We guarantee that our PerkinElmer Pure Atomic Spectroscopy Standards are stable and accurate to $\pm 0.5\%$ of certified concentration until the expiration date, provided the standards are kept tightly capped and stored under normal laboratory conditions. This value is the sum of cumulative errors associated with the analytical determinations, pipetting, and diluting to final volume. For these solutions we use high purity acids, ASTM Type I water (18 megohm double deionized), and leached, triple-rinsed bottles. All glassware used is class A.



Certifying Officer:

Y. Parikh

PerkinElmer®

PerkinElmer, Inc.

U.S.A. Tel: 1-203-925-4600

U.S.A. Toll Free: 1-800-762-4000

Visit www.perkinelmer.com/lasoffices for a complete listing of our global offices.



PerkinElmer Pure

PerkinElmer Number: N9300183
Element and Matrix: 1000 µg/mL Copper in 2% HNO₃
Starting Material: Copper Metal
Starting Material Lot No: 111411
Density: 1.011 g/mL @ 20°C

Lot No: 25-20CUY1
Certification Date: JUL - - 2020
Expiration Date: JAN 30 2022

Trace Metallic Impurities in the Actual Solution via ICP / ICP-MS Analysis:

Element	µg/mL	Element	µg/mL	Element	µg/mL	Element	µg/mL	Element	µg/mL
Ag	<0.001	Dy	<0.001	Li	<0.001	Pt	<0.001	Tb	<0.001
Al	0.008	Er	<0.001	Lu	<0.001	Rb	<0.001	Te	<0.001
As	<0.001	Eu	<0.001	Mg	<0.002	Re	<0.001	Th	<0.001
Au	<0.001	Fe	<0.002	Mn	<0.001	Rh	0.04	Ti	<0.001
B	<0.005	Ga	<0.001	Mo	<0.001	Ru	<0.001	Tl	<0.001
Ba	<0.001	Gd	<0.001	Na	0.003	Sb	<0.001	Tm	<0.001
Be	<0.001	Ge	<0.002	Nb	<0.001	Sc	<0.001	U	<0.001
Bi	<0.001	Hf	<0.001	Nd	<0.001	Se	<0.001	V	<0.001
Ca	0.02	Hg	0.02	Ni	<0.001	Si	<0.1	W	<0.001
Cd	<0.001	Ho	<0.001	P	<0.1	Sm	<0.001	Y	<0.001
Ce	<0.001	In	<0.001	Pb	<0.001	Sn	<0.001	Yb	<0.001
Co	<0.001	Ir	<0.001	Pd	<0.001	Sr	<0.001	Zn	0.007
Cr	<0.002	K	<0.003	Pr	<0.001	Ta	<0.001	Zr	<0.001
Cs	<0.001	La	<0.001						

Traceability Documentation for Solution Standard:

Certified Value: 998 µg/mL ±5 µg/mL (refer to side 2)
Certified Value is Traceable to: NIST SRM #3114
* Classical Wet Assay: 996 µg/mL
Method: EDTA titration using PAN as indicator. EDTA standardized against Pb(NO₃)₂ NIST SRM #928.

*Instrument Analysis using ICP Spectrometer: 1000 µg/mL
via NIST SRM #3114

We guarantee that our PerkinElmer Pure Atomic Spectroscopy Standards are stable and accurate to ±0.5% of certified concentration until the expiration date, provided the standards are kept tightly capped and stored under normal laboratory conditions. This value is the sum of cumulative errors associated with the analytical determinations, pipetting, and diluting to final volume. For these solutions we use high purity acids, ASTM Type 1 water (18 megohm double deionized), and leached, triple-rinsed bottles. All glassware used is class A.

Certifying Officer:

Y. Parikh
Yogesh Parikh, Senior Spectroscopist



PerkinElmer Ltd.
 Soi 17 Rama 9 Road
 Khwang Bangkapi, Khet Huay Kwang
 Bangkok 10310
 Thailand
 Tel: 66 2719 6420 ; Fax: +66 2 319 7900
<http://www.perkinelmer.com>

Service Report

Work Order Number	Activity Code	Billing Type	Requested Start Date	Model	Serial Number
WO-01335679	Planned Maintenance	Contract	05/07/2564 16:54 น.	AANALYST400	201S5082209
Service Representative Name	Contract Number	Expiry Date	Equipment ID	System ID	
Promlumda Wiphan	SC-0035481496	15/11/2022	N/A	N/A	
UDI Number					
N/A					
Equipment Location			Bill To Name		
บริษัท เอ็นไวรโอโปร จำกัด เขตลาดพร้าว กรุงเทพฯ 51 10230 TH			บริษัท เอ็นไวรโอโปร จำกัด เขตลาดพร้าว กรุงเทพฯ 51 10230 TH		
Customer Contact	Phone Number	Fax Number	Email	Purchase Order	
คุณวีรเทพ	02-831 6695	02-831-6645	envirpro@yahoo.com	6207205	

Work Description		
Cleaning Spray Chamber / Nebulizer / End Cap / Burner / burner Assembly. Replace O-ring all if necessary. Clean up the Mirror if necessary. Cleaning Sample compartment / Clean drain assembly Check Optic / Check Electronic PCB. Perform Wavelength Scan such as Cu / Ni / Ba Replace Air filter Perform wavelength Calibration Replace Acetylene filter Check Gas leakage all connecting gases hose. Remove all log error in software datamanager Backup data result / method Do for all detail following in the check list in PM checklist sheet. Test all interlock safety such as Fuel / Air / Nebulizer / Burner / Drain . Test performance Test Flame		
Start Date	End Date	Work Description
04/08/2021	04/08/2021	
04/08/2021	04/08/2021	

Tools Used					
Quantity	Calibrated Tool	Description	Serial Number	Last Calibration Date	Next Calibration Date
*** No Calibrated Tools Used ***					

Material Used				
Part Number	Part Description	Note	Lot/Serial Number	Quantity
*** No Parts Used ***				

Labour Details			
Part Number	Part Description	Start Date	Quantity
SV000013	Preventative maintenance	04/08/2021	3
SV000002	Service Travel	04/08/2021	2

Work Complete	Customer Signature	Technician Signature