

ภาคผนวก จ

เอกสารการสอบเทียบ
เครื่องมือตรวจวัดและวิเคราะห์



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-65/0051

MTC.No.23-65/0051

Number of page(s) 2

CALIBRATION CERTIFICATE

Nomenclature : PRIMARY GAS FLOW CALIBRATOR

Manufacturer : A.P. Buck Inc.

Serial No.: 011324

Model : -

Scale range : 1 ccm to 6000 ccm

Subdivision : (0.1, 1) ccm

Submitted by : SAFETY PLAN CO.,LTD.

1034 Moo3, Rangsit-Pathum Thani Rd., T.Bangpoo,

A.Muang, Pathum Thani 12000, Thailand.

Received date : 25 October 2021

Condition of measured item : Normal

Calibration date : 16 November 2021

Standard :

Standard	Certificate No.	Date due	Traceability
RTD Thermometer	PSL-T 336/63	6-Apr-22	TISTR
Molbox/PressureTransducer/UpStream	MP-0013-21	25-Jan-23	NIMT
Primary Flow Calibrator S/N 117982	MW-0011-21	8-Apr-23	NIMT
Primary Flow Calibrator S/N 119521	MW-0012-21	31-Mar-23	NIMT

Calibrated by : Terasak Panna

(Mr.Terasak Panna)

Approved by : Kirana Luanghirun

(Ms.Kirana Luanghirun)

Director

Mechanical Engineering Standards Laboratory

Ref. 2013264102504367001

Issued Date 16 November 2021

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FM.BL.MTC.002 Rev.4

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Request No.23-65/0051

2/2

MTC.No.23-65/0051

Calibration point : (50, 1500, 3000) ccm

Ambient condition : Temperature (23 ± 3) °C , Relative humidity (55 ± 15) %

Atmospheric pressure (1010 ± 13) hPa

Calibration method : The flowmeter (UUC) was calibrated by comparison method with standard flowmeter according to CP-370.01.

The reported value is the value that converted to value at reference condition within pressure and temperature of the actual gas entering the UUC

Measurement data :

UUC Value (ccm)	Standard Value (ccm)	Temperature (°C)	Pressure (hPa)	Deviation (%)	Uncertainty (%)
50.18	51.126	22.462	1010.61	+0.11	1.16
1511	1499.2	22.560	1010.52	+0.81	0.89
3032	3054.2	22.727	1010.83	-0.73	0.88

The reported expanded uncertainties are based on standard uncertainties multiplied by a coverage factor $k=2$, which provides a level of confidence of approximately 95%.

The end of calibration certificate.

Ts.

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-65/0353

MTC.No.23-65/0353

Number of page(s) 2

CALIBRATION CERTIFICATE

Nomenclature : DRYCAL DC-LITE PRIMARY FLOWMETER

Manufacturer : BIOS International Corporation, USA.

Serial No.: 5016

Model : DCL-M

Scale range : 100 ml/min to 7 l/min

Subdivision : (0.0001, 0.001) l/min

Submitted by : SAFETY PLAN CO.,LTD.

1034 Moo3, Rangsit-Pathum Thani Rd., T.Bangpooon,
A.Muang, Pathum Thani 12000, Thailand.

Received date : 8 April 2022

Condition of measured item : Normal

Calibration date : 22 April 2022

Standard :

Standard	Certificate No.	Date due	Traceability
RTD Thermometer	PSL-T 336/63	6-Apr-22	TISTR
Molbox/Pressure Transducer/UpStream	MP-0013-21	25-Jan-23	NIMT
Primary Flow Calibrator S/N 117982	MW-0011-21	8-Apr-23	NIMT
Primary Flow Calibrator S/N 119521	MW-0012-21	31-Mar-23	NIMT

Calibrated by : *Terasak Panna*

(Mr.Terasak Panna)

Approved by : *K. Kiraha Luanghirun*

(Ms.Kiraha Luanghirun)

Director

Mechanical Engineering Standards Laboratory

Ref. 2013265040801647001

Issued Date 22 April 2022

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-65/0353

2/2

MTC.No.23-65/0353

Calibration point : (200, 500, 1000, 2000, 5000) ml/min

Ambient condition : Temperature (23 ± 3) °C , Relative humidity (55 ± 15) %

Atmospheric pressure (1010 ± 13) hPa

Calibration method : The flowmeter (UUC) was calibrated by comparison method with standard flowmeter according to CP-370.01.

The reported value is the value that converted to value at reference condition within pressure and temperature of the actual gas entering the UUC

Measurement data :

UUC Value (ml/min)	Standard Value (ml/min)	Temperature (°C)	Pressure (hPa)	Deviation (%)	Uncertainty (%)
202.2	202.20	23.812	1006.01	+0.01	0.99
502.2	502.80	23.798	1006.07	-0.11	0.99
1014	1015.4	23.791	1006.15	-0.10	0.86
2002	2006.6	23.790	1006.26	-0.23	0.86
5023	5051.4	23.759	1006.77	-0.57	0.87

The reported expanded uncertainties are based on standard uncertainties multiplied by a coverage factor $k=2$, which provides a level of confidence of approximately 95%.

The end of calibration certificate.

T.S.

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-65/0315

MTC.No.23-65/0315

Number of page(s) 2

CALIBRATION CERTIFICATE

Nomenclature : DRYCAL DC-LITE PRIMARY FLOWMETER

Manufacturer : BIOS International Corporation, USA.

Serial No.: 1210

Model : DCL-L

Scale range : 10 ml/min to 500 ml/min

Subdivision : (0.1, 0.01) ml/min

Submitted by : SAFETY PLAN CO.,LTD.

1034 Moo3, Rangsit-Pathum Thani Rd., T.Bangpoo,

A.Muang, Pathum Thani 12000, Thailand.

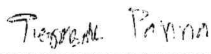
Received date : 17 March 2022

Condition of measured item : Normal

Calibration date : 28 March 2022

Standard :

Standard	Certificate No.	Date due	Traceability
RTD Thermometer	PSL-T 336/63	6-Apr-22	TISTR
Molbox/PressureTransducer/UpStream	MP-0013-21	25-Jan-23	NIMT
Primary Flow Calibrator S/N 117982	MW-0011-21	8-Apr-23	NIMT

Calibrated by : 

(Mr.Terasak Panna)

Approved by : 
(Ms.Kirana Luanghirun)

Director

Mechanical Engineering Standards Laboratory

Ref. 2013265031701242001

Issued Date 28 March 2022

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Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-65/0315

2/2

MTC.No.23-65/0315

Calibration point : (100, 200, 300, 400, 500) ml/min

Ambient condition : Temperature (23 ± 3) °C , Relative humidity (55 ± 15) %

Atmospheric pressure (1010 ± 13) hPa

Calibration method : The flowmeter (UUC) was calibrated by comparison method with standard flowmeter according to CP-370.01.

The reported value is the value that converted to value at reference condition within pressure and temperature of the actual gas entering the UUC

Measurement data :

UUC Value (ml/min)	Standard Value (ml/min)	Temperature (°C)	Pressure (hPa)	Deviation (%)	Uncertainty (%)
100.6	98.545	21.999	1010.92	+2.05	1.01
202.0	199.07	22.045	1010.99	+1.46	0.98
297.9	295.46	22.351	1011.15	+0.83	1.02
400.0	400.53	22.468	1011.36	-0.14	1.02
504.6	499.98	22.450	1011.45	+0.93	1.03

The reported expanded uncertainties are based on standard uncertainties multiplied by a coverage factor $k=2$, which provides a level of confidence of approximately 95%.

The end of calibration certificate.

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Envi Equipment Service Co., Ltd.

110/254 Moo 3, Tumbon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110

Tel. 098 362 9152, 089 478 7885

E-mail: sales@envi-ees.com

Certificate No. : E21-1041

Page : 1 of 6

CERTIFICATE OF CALIBRATION

Customer : Safety Plan Co., Ltd.

Address : 1034 Moo 3, Rang sit-Pathum Thani Rd., T. Bangpoon, A. Muang, Pathum Thani 12000

Description of Equipment : Console meter

Manufacturer : Apex Instrument

Model Number : MC-572VS

Serial Number : 0506007

ID./Control No. : -

Environment Conditions : Temperature (25 ± 2) °C
: Humidity (50 ± 15) % RH

Cal. Date : 26/10/2021

Issue Date : 26/10/2021

Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)


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

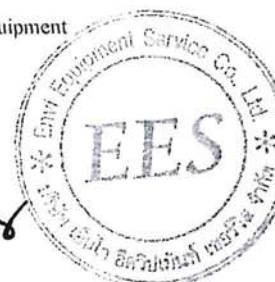
Result of Calibration

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by : Mr. Sanya Sangnil

Approved by : 
(Mr. Mana Fuekhud)
Technical Manger



METHOD 5 CONSOLE CALIBRATION USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425 5-POINT METRIC UNIT

Meter Console Information	
Console Model Number	MC-572VS
Console Serial Number	0506007
DGM Model Number	SK25EX
DGM Serial Number	00003585

Calibration Conditions			
Date	Time	26/10/2021	12:00 PM
Calibration Reference No.	Ser21-1041		
Barometric Pressure	758.99	mm Hg	
Calibration Meter Gamma	0.999		

Factors/Conversions		
Std Temp	293	K
Std Press	760	mm Hg
K ₁	0.386	
Console Leak Check	PASS	

Calibration Data									
Run Time	Metering Console					Calibration Meter			
Elapsed	DGM Orifice DH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final
(Q)	(P _m)	(V _{mi})	(V _{mf})	(t _{mi})	(t _{mf})	(V _{wi})	(V _{wf})	(t _{wi})	(t _{wf})
min	mm H ₂ O	m ³	m ³	°C	°C	m ³	m ³	°C	°C
12.05	13.0	475.8500	475.9900	28	28	43.98354	44.12502	28	28
12.08	13.0	475.9900	476.1300	27	27	44.12502	44.26632	26	26
8.48	26.0	476.1410	476.2810	27	27	44.27666	44.41942	26	26
8.48	26.0	476.2810	476.4210	27	27	44.41942	44.56226	25	25
13.90	40.0	476.4300	476.7100	27	27	44.58342	44.86648	25	25
13.92	40.0	476.7100	476.9900	27	27	44.86648	45.15028	25	25
10.42	70.0	476.9990	477.2790	26	26	45.16234	45.44374	25	25
10.43	70.0	477.2790	477.5590	26	26	45.44374	45.72500	25	25
9.10	90.0	477.5670	477.8470	26	26	45.74624	46.02905	25	25
9.10	90.0	477.8470	478.1270	26	26	46.02905	46.31078	25	25



**METHOD 5 CONSOLE CALIBRATION
USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425
5-POINT METRIC UNIT**

Calibration Data								
Results								
Standardized Data				Dry Gas Meter				
Dry Gas Meter		Calibration Meter		Calibration Factor		Flowrate		
(V _{m(std)})	(Q _{m(std)})	(V _{w(std)})	(Q _{w(std)})	Value	Variation	Std & Corr	.0212 m ³ _{std} /min	Variation
m ³	m ³ /min	m ³	m ³ /min	(Y)	(ΔY)	(Q _{m(std)} (corr))	(ΔH _@)	(ΔH _@)
						m ³ /min	mm H ₂ O	
0.136	0.011	0.137	0.011	1.008	0.003	0.011	43.940	-0.014
0.137	0.011	0.138	0.011	1.007	0.002	0.011	44.001	0.048
0.137	0.016	0.140	0.016	1.016	0.011	0.016	42.601	-1.352
0.138	0.016	0.140	0.017	1.017	0.011	0.017	42.411	-1.543
0.276	0.020	0.278	0.020	1.006	0.001	0.020	44.728	0.774
0.276	0.020	0.278	0.020	1.009	0.003	0.020	44.602	0.648
0.277	0.027	0.276	0.026	0.997	-0.008	0.026	44.737	0.783
0.277	0.027	0.276	0.026	0.997	-0.009	0.026	44.925	0.971
0.277	0.030	0.277	0.030	1.000	-0.005	0.030	43.628	-0.326
0.277	0.030	0.276	0.030	0.996	-0.009	0.030	43.963	0.009
				1.005	Y Average		43.953	ΔH _@ Average

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

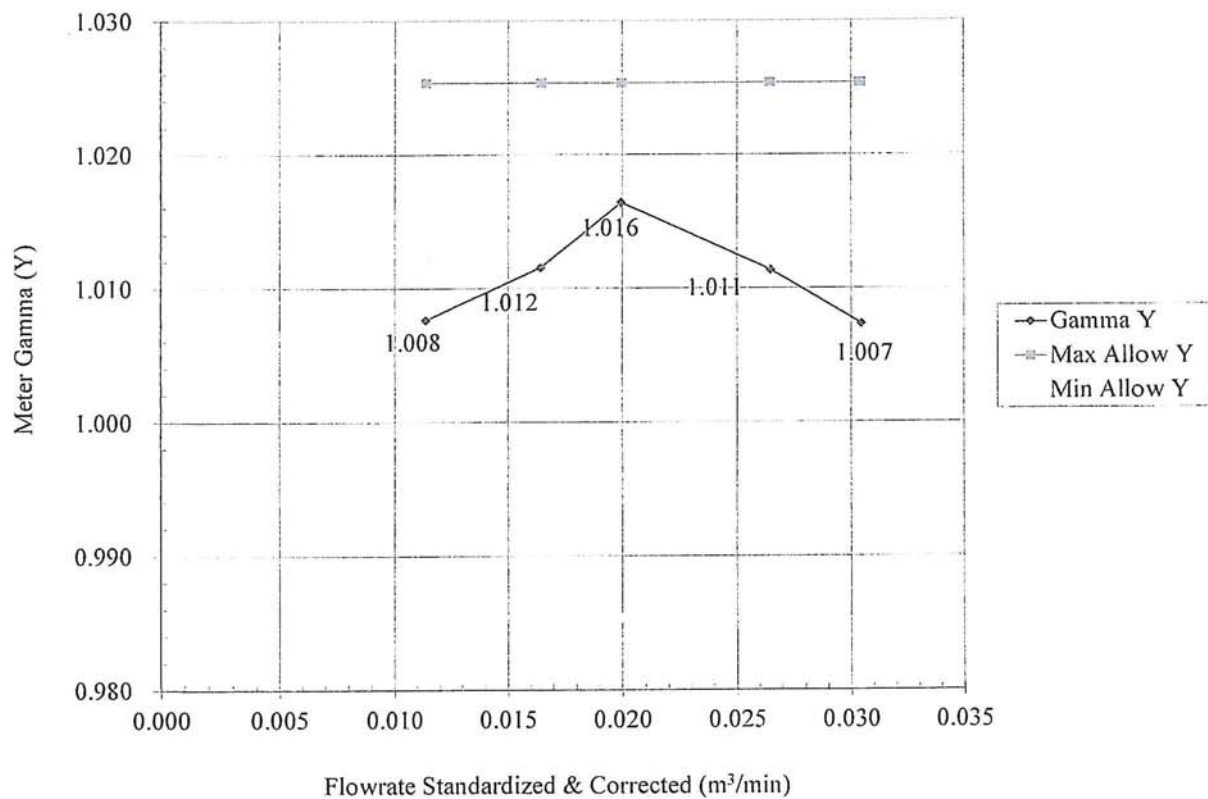
For ΔH_@, orifice pressure differential that equates to 0.75 cfm (0.0212 m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2 inches (5.1mm) H₂O.



Calibration Date: 26-10-2021

Calibration Reference No: SER21-1041

Meter Gamma vs Flowrate



Console Serial: 0506007

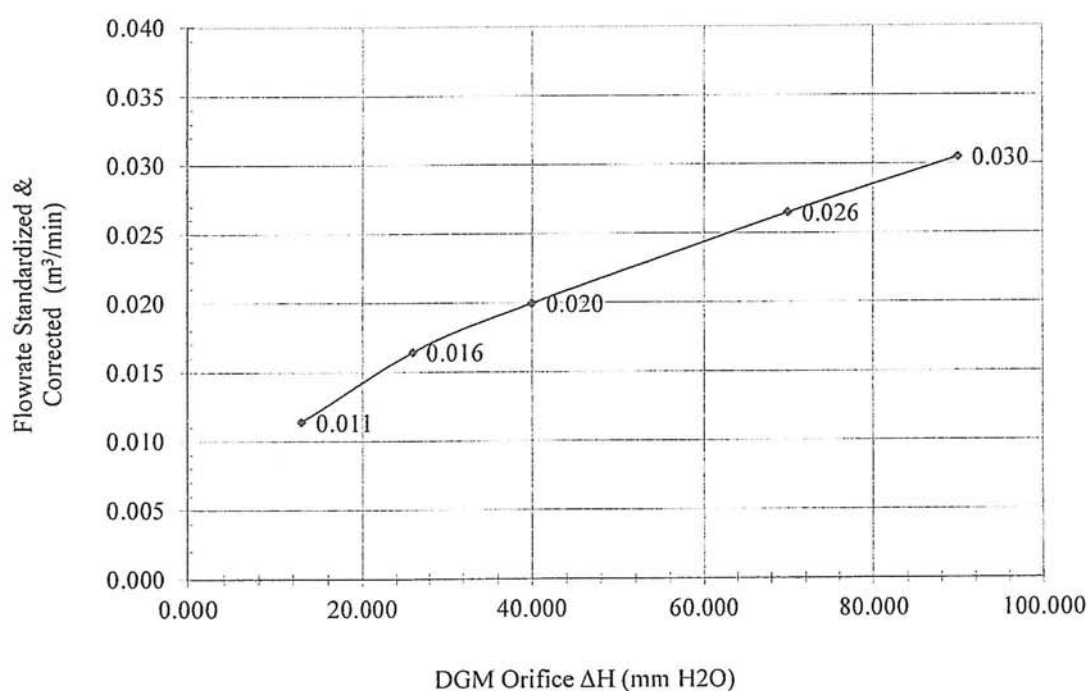
Console Model: MC-572VS



Calibration Date: 26-10-2021

Calibration Reference No: SER21-1041

Meter Pressure vs Flowrate



Console Serial: 0506007

Console Model: MC-572VS



THERMOCOUPLES SYSTEM CALIBRATION

Sampling System Equipment Information	
Console Model Number	MC-572VS
Console Serial Number	0506007
DGM Model Number	SK25EX
DGM Serial Number	00003585
Meter Box Model Number	JENCO 765 KF
Meter Box Serial Number	

Calibration Conditions			
Date	Time	26/10/2564	02:20 PM
Calibration Reference No.		SER21-1041	
Reference Thermometer		DIGICON	
Serial Number		183169105	

Results											
Console Thermocouple Simulator											
Channel and test point	Meter Box Channel Temperature Reading (°C)										
	-18.0	25.0	38.0	93.0	149.0	260.0	371.0	482.0	593.0	816.0	1038.0
Stack	-18.0	23.0	36.0	92.0	148.0	258.0	370.0	481.0	592.0	815.0	1037.0
Aux	-18.0	23.0	36.0	92.0	148.0						
Probe	-18.0	23.0	36.0	92.0	148.0						
Filter	-18.0	23.0	36.0	92.0	148.0						
Oven	-	-	-	-	-						
Exit	-18.0	23.0	36.0								

Tolerance Range

Stack	± 1.50%	Absolute
Probe	± 3.0 °C	
Filter	± 3.0 °C	

Meter	±	3.0 °C
Exit	±	2.0 °C



Envi Equipment Service Co., Ltd.

110/254 Moo 3, Tumbon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110

Tel. 098 362 9152, 089 478 7885

E-mail: sales@envi-ees.com

Certificate No. : E21-1042

Page : 1 of 2

CERTIFICATE OF CALIBRATION

Customer : Safety Plan Co.,Ltd.

Address : 1034 Moo 3, Rang sit-Pathum Thani Rd., T. Bangpoorn, A. Muang, Pathum Thani 12000

Description of Equipment : Nozzle

Manufacturer : Apex Instrument

Model Number : NS SET

Serial Number : -

ID./Control No. : -

Environment Conditions : Temperature (25 ± 2) °C
Humidity (50 ± 15) % RH

Cal. Date : 26/10/2021

Issue Date : 26/10/2021

Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)

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

Result of Calibration

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These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by : Mr. Sanya Sangnil

Approved by : 

(Mr. Mana Fuekhud)

Technical Manger



CALIBRATION RESULTS

Sampling System Equipment Information

Nozzle Model : NS SET
Nozzle Number : -
Nozzle Type : Stainless Steel

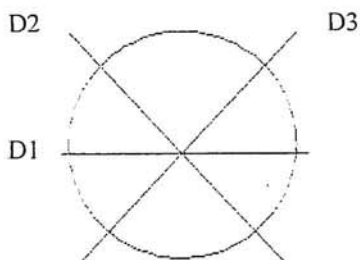
Calibration Condition

Date : 26 October 2021
Barometric Pressure : 758.99 mm Hg
Calibration Device : Vernier, 0-150 mm
Method Reference : US. EPA Method

Nozzle ID	Nozzle Diameter				Different	(D1 + D2 + D3) / 3
Size	mm	D1 mm	D2 mm	D3 mm	ΔD mm	Davg mm
NS-4	3.18	3.08	3.06	3.05	0.015	3.063
NS-6	4.76	4.72	4.70	4.69	0.015	4.703
NS-8	6.35	6.41	6.41	6.44	0.017	6.420
NS-16	12.70	12.00	12.00	12.14	0.081	12.047

Remark:

D1, D2, D3 = There difference nozzle diameters, mm; diameter must be within 0.025 mm
 ΔD = Maximum difference between any two diameters, must be ≤ 0.100 mm
 Davg = $(D_1 + D_2 + D_3) / 3$



Envi Equipment Service Co., Ltd.

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Tel. 098 362 9152; 089 478 7885

E-mail: sales@envi-ees.com

Certificate No. : E21-1043

Page : 1 of 3

CERTIFICATE OF CALIBRATION

Customer : Safety Plan Co.,Ltd.

Address : 1034 Moo 3, Rang sit-Pathum Thani Rd., T. Bangpoon, A. Muang, Pathum Thani 12000

Description of Equipment : Standard Probe Method 5

Manufacturer : Apex Instrument

Model Number : PS-6HV

Serial Number : 1911338

ID./Control No. : -

Environment Conditions : Temperature (25 ± 2) °C
: Humidity (50 ± 15) % RH

Cal. Date : 26/10/2021

Issue Date : 26/10/2021

Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)

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

Result of Calibration

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by : Mr. Sanya Sangnil

Approved by : 

(Mr. Mana Fuekhud)

Technical Manger



CALIBRATION RESULTS

S-Type Geometric Pitot Tube Calibration

Sampling System Equipment Information

Probe Model	:	PS-6HV
Probe Number	:	1911338
Pitot Number	:	-
Pitot Tube Type	:	S-type

Calibration Condition

Date	:	26 October 2021
Barometric Pressure	:	758.99 mm Hg
Digital Caliper	:	CD-6" ASX
Serial number	:	A18008059

Pitot tube/Probe: # PS-6HV			
Parameter	Value	Allowable Range	Check
Assembly level?	Yes	Yes	Pass
Ports Damage?	No	No	Pass
$\alpha 1$	0	$-10^\circ < \alpha 1 < +10^\circ$	Pass
$\alpha 2$	1	$-10^\circ < \alpha 2 < +10^\circ$	Pass
$\beta 1$	0	$-5^\circ < \beta 1 < +5^\circ$	Pass
$\beta 2$	0	$-5^\circ < \beta 2 < +5^\circ$	Pass
γ	0	N/A	-
ϕ	0	N/A	-
Dt	0.375	.188 " to .375 "	Pass
A	0.921	$2.1Dt \leq A \leq 3Dt$	Pass
A/2Dt	1.228	$1.05 \leq P_A/D_t \leq 1.5$	Pass
$Z = A \tan \gamma$	0.047	$Z \leq .125"$	Pass
$W = A \tan \phi$	0.015	$W \leq .031"$	Pass

Remark:

I certified that pitot tube /probe number/Model: PS-6HV :1911338 meets or exceeds all specifications, criteria and/or applicable design and is hereby assigned a pitot tube certification factor of **0.84**. See 40 CFR Pt. 60, App. A, EPA Method 2.



THERMOCOUPLES SYSTEM CALIBRATION

Sampling System Equipment Information	
Probe Model Number	PS-6HV
Probe Serial Number	1911338
Meter Box Model Number	JENCO 765 KF
Meter Box Serial Number	-

Calibration Conditions			
Date	Time	26/10/2021	04:30 PM
Calibration Reference No.		SER21-1043	
Reference Thermometer		DIGICON	
Serial Number		183169105	

Thermocouple of Standard Probe method 5 = length 6 foot			
Set Point	Reference Thermocouple	Probe Thermocouple	Difference
100	100.0	99.0	0.27
250	250.0	248.0	0.38
300	300.0	297.0	0.52
350	350.0	348.0	0.32



Envi Equipment Service Co., Ltd.

110/254 Moo 3, Tumbon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110

Tel. 098 362 9152, 089 478 7885

E-mail: sales@envi-ees.com

Certificate No. : E22-11048

Page : 1 of 6

CERTIFICATE OF CALIBRATION

Customer : Safety Plan Co., Ltd.

Address : 1034 Moo 3, Rang sit-Pathum Thani Rd., T. Bangpoorn, A. Muang,
Pathum Thani 12000

Description of Equipment : Console meter

Manufacturer : Apex Instrument

Model Number : MC-572VS

Serial Number : 0506007

ID./Control No. : -

Environment Conditions : **Temperature** (25 ± 2) °C
: **Humidity** (50 ± 15) % RH

Cal. Date : 26/10/2022

Issue Date : 26/10/2022

Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)


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

Result of Calibration

This certificate may not be reproduced other than in full except with prior Written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by : Mr. Sanya Sangnil

Approved by : 

(Mr. Mana Fuekhud)

Technical Manger



**METHOD 5 CONSOLE CALIBRATION
USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425
5-POINT METRIC UNIT**

Meter Console Information	
Console Model Number	MC-572VS
Console Serial Number	0506007
DGM Model Number	SK25EX
DGM Serial Number	00003585

Calibration Conditions			
Date	Time	26/10/2022	10:40 AM
Calibration Reference No.		E22-11048	
Barometric Pressure		758.99	mm Hg
Calibration Meter Gamma		0.999	

Factors/Conversions		
Std Temp	293	K
Std Press	760	mm Hg
K ₁	0.386	
Console Leak Check		PASS

Calibration Data									
Run Time	Metering Console					Calibration Meter			
Elapsed	DGM Orifice DH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final
(Q)	(P _m)	(V _{mi})	(V _{mf})	(t _{mi})	(t _{mf})	(V _{wi})	(V _{wf})	(t _{wi})	(t _{wf})
min	mm H ₂ O	m ³	m ³	°C	°C	m ³	m ³	°C	°C
12.27	13.0	883.0880	883.2280	27	27	100.06672	100.21284	26	26
12.43	13.0	883.2280	883.3680	27	27	100.21284	100.35916	25	25
8.47	26.0	883.3790	883.5190	26	26	100.37252	100.51736	25	25
8.47	26.0	883.5190	883.6590	26	26	100.51736	100.66214	25	25
14.15	40.0	883.6660	883.9460	26	26	100.66938	100.96134	26	26
14.08	40.0	883.9460	884.2260	27	27	100.96134	101.25200	26	26
10.50	70.0	884.2350	884.5150	27	27	101.26126	101.54854	26	26
10.45	70.0	884.5150	884.7950	27	27	101.54854	101.83516	26	26
9.27	90.0	884.8070	885.0870	27	27	101.84736	102.13448	25	25
9.23	90.0	885.0870	885.3670	27	27	102.13448	102.42070	25	25



Meter Console Information	
Console Model Number	MC-572VS
Console Serial Number	0506007
DGM Model Number	SK25EX
DGM Serial Number	00003585

Calibration Conditions			
Date	Time	26/10/2022	10:40 AM
Calibration Reference No.		E22-11048	
Barometric Pressure		758.99	mm Hg
Calibration Meter Gamma		0.999	

Factors/Conversions		
Std Temp	293	K
Std Press	760	mm Hg
K ₁	0.386	
Console Leak Check		PASS

Calibration Data								
Results								
Standardized Data				Dry Gas Meter				
Dry Gas Meter		Calibration Meter		Calibration Factor		Flowrate		
(V _{m(std)})	(Q _{m(std)})	(V _{w(std)})	(Q _{w(std)})	Value	Variation	Std & Corr	.0212 m ³ _{std} /min	Variation
m ³	m ³ /min	m ³	m ³ /min	(Y)	(ΔY)	(Q _{m(std)(corr)})	(ΔH _@)	(ΔH _@)
						m ³ /min	mm H ₂ O	
0.137	0.011	0.143	0.012	1.041	0.014	0.012	42.404	-0.632
0.138	0.011	0.144	0.012	1.043	0.015	0.012	43.300	0.264
0.138	0.016	0.142	0.017	1.031	0.003	0.017	41.086	-1.951
0.138	0.016	0.142	0.017	1.031	0.003	0.017	41.120	-1.917
0.275	0.019	0.285	0.020	1.038	0.010	0.020	43.715	0.678
0.275	0.020	0.284	0.020	1.033	0.005	0.020	43.692	0.655
0.276	0.026	0.281	0.027	1.018	-0.010	0.027	43.760	0.723
0.276	0.026	0.280	0.027	1.016	-0.012	0.027	43.544	0.508
0.277	0.030	0.282	0.030	1.016	-0.012	0.030	43.892	0.856
0.277	0.030	0.281	0.030	1.012	-0.015	0.030	43.852	0.815
				1.028	Y Average		43.037	ΔH _@ Average

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

For $\Delta H_{@}$, orifice pressure differential that equates to 0.75 cfm (0.0212 m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ± 0.2 inches (5.1mm) H₂O.



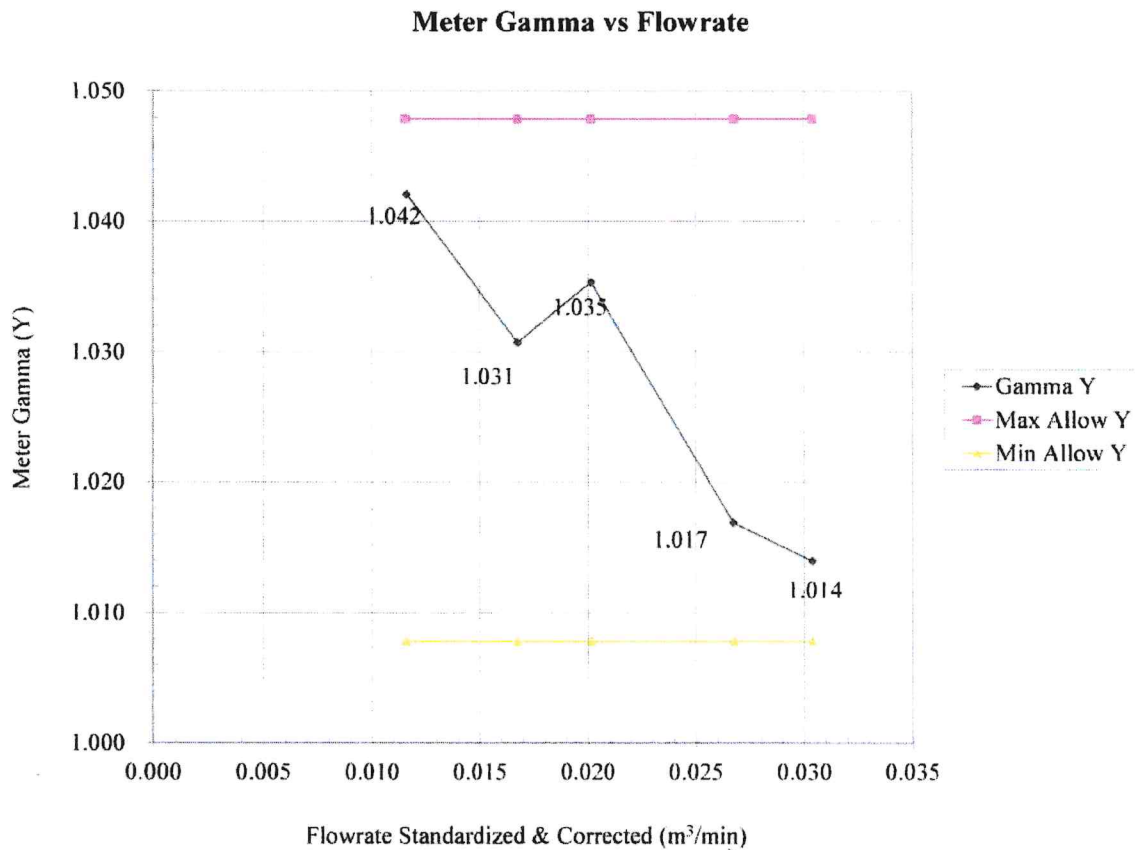
Meter Console Information	
Console Model Number	MC-572VS
Console Serial Number	0506007
DGM Model Number	SK25EX
DGM Serial Number	00003585

Calibration Conditions			
Date	Time	26/10/2022	10:40 AM
Calibration Reference No.		E22-11048	
Barometric Pressure		758.99	mmHg
Calibration Meter Gamma		0.999	

Factors/Conversions		
Std Temp	293	K
Std Press	760	mm Hg
K ₁	0.386	
Console Leak Check		PASS

Calibration Date: 12-11-2022

Calibration Reference No: E22-11048



Console Serial: 0506007

Console Model: MC-572VS



Meter Console Information	
Console Model Number	MC-572VS
Console Serial Number	0506007
DGM Model Number	SK25EX
DGM Serial Number	00003585

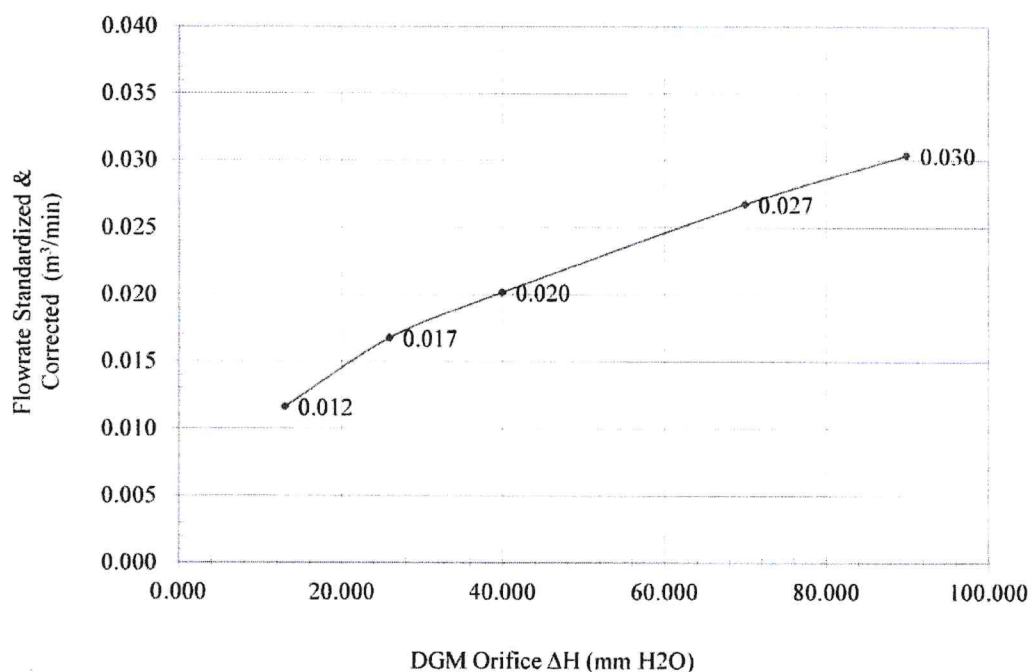
Calibration Conditions			
Date	Time	26/10/2022	10:40 AM
Calibration Reference No.		E22-11048	
Barometric Pressure		758.99	mmHg
Calibration Meter Gamma		0.999	

Factors/Conversions		
Std Temp	293	K
Std Press	760	mm Hg
K ₁	0.386	
Console Leak Check		PASS

Calibration Date: 12-11-2022

Calibration Reference No: E22-11048

Meter Pressure vs Flowrate



Console Serial: 0506007

Console Model: MC-572VS



THERMOCOUPLES SYSTEM CALIBRATION

Sampling System Equipment Information	
Console Model Number	MC-572VS
Console Serial Number	0506007
DGM Model Number	SK25EX
DGM Serial Number	00003585
Meter Box Model Number	JENCO 765 KF
Meter Box Serial Number	JC 16047

Calibration Conditions			
Date	Time	26/10/2022	03:15 PM
Calibration Reference No.		E22-11048	
Reference Thermometer		DIGICON	
Serial Number		183169105	

Results											
Console Thermocouple Simulator											
Channel and test point	Meter Box Channel Temperature Reading (°C)										
	-18.0	25.0	38.0	93.0	149.0	260.0	371.0	482.0	593.0	816.0	1038.0
Stack	-18.0	23.0	36.0	91.0	147.0	257.0	369.0	480.0	591.0	814.0	1036.0
Aux	-18.0	23.0	36.0	91.0	147.0						
Probe	-18.0	23.0	36.0	91.0	147.0						
Filter	-18.0	23.0	36.0	91.0	147.0						
Exit	-18.0	23.0	36.0								

Tolerance Range

Stack ± 1.50% Absolute
 Probe ± 3.0 °C
 Filter ± 3.0 °C

Meter ± 3.0 °C
 Exit ± 2.0 °C



Envi Equipment Service Co., Ltd.

110/254 Moo 3, Tumbon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110

Tel. 098 362 9152, 089 478 7885

E-mail: sales@envi-ees.com

Certificate No. : E22-11050

Page : 1 of 3

CERTIFICATE OF CALIBRATION

Customer : Safety Plan Co., Ltd.

Address : 1034 Moo 3, Rang sit-Pathum Thani Rd., T. Bangpoon, A. Muang, Pathum Thani 12000

Description of Equipment : Standard Probe Method 5

Manufacturer : Apex Instrument

Model Number : PS-6HV

Serial Number : -

ID./Control No. : -

Environment Conditions : **Temperature** (25 ± 2) °C
: **Humidity** (50 ± 15) % RH

Cal. Date : 26/10/2022

Issue Date : 26/10/2022

Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)


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

Result of Calibration

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These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by : Mr. Sanya Sangnil

Approved by : 
(Mr. Mana Fuekhud)
Technical Manager



CALIBRATION RESULTS

S-Type Geometric Pitot Tube Calibration

Sampling System Equipment Information

Probe Model	:	PS-6HV
Probe Number	:	W1911338
Pitot Number	:	-
Pitot Tube Type	:	S-type

Calibration Condition

Date	:	26 October 2022
Barometric Pressure	:	760.49 mm Hg
Digital Caliper	:	CD-6" ASX
Serial number	:	A18008059

Pitot tube/Probe: # PS-6HV			
Parameter	Value	Allowable Range	Check
Assembly level?	Yes	Yes	Pass
Ports Damage?	No	Yes	Not Pass
$\alpha 1$	0	$-10^{\circ} < \alpha 1 < +10^{\circ}$	Pass
$\alpha 2$	1	$-10^{\circ} < \alpha 2 < +10^{\circ}$	Pass
$\beta 1$	0	$-5^{\circ} < \beta 1 < +5^{\circ}$	Pass
$\beta 2$	0	$-5^{\circ} < \beta 2 < +5^{\circ}$	Pass
γ	0	N/A	-
θ	0	N/A	-
Dt	0.375	.188 " to .375 "	Pass
A	0.881	$2.1Dt \leq A \leq 3Dt$	Pass
A/2Dt	1.174	$1.05 \leq P_1/D_t \leq 1.5$	Pass
$Z = A \tan \gamma$	0.072	$Z \leq .125"$	Pass
$W = A \tan \theta$	0.021	$W \leq .031"$	Pass

Remark:

I certified that probe number: **W1911338** not meets or exceeds all specifications, criteria and/or applicable design and is hereby assigned a pitot tube certification factor of **0.84**. See 40 CFR Pt. 60, App. A, EPA Method 2.



THERMOCOUPLES SYSTEM CALIBRATION

Sampling System Equipment Information	
Probe Model Number	PS-6HV
Probe Serial Number	W 1911338
Meter Box Model Number	JENCO 765 KF
Meter Box Serial Number	JC 16347

Calibration Conditions			
Date	Time	26/10/2022	02:30 PM
Calibration Reference No.		E22-11050	
Reference Thermometer		DIGICON	
Serial Number		183169105	

Thermocouple of Standard Probe method 5 = length 6 foot			
Set Point	Reference Thermocouple	Probe Thermocouple	Difference
100	100.0	98.0	0.54
250	250.0	249.0	0.19
300	300.0	298.0	0.35
350	350.0	349.0	0.16



Envi Equipment Service Co., Ltd.

110/254 Moo 3, Tumbon Bang Rak Phatthana, Amphur Bang Bua Thong, Nonthaburi 11110

Tel. 098 362 9152, 089 478 7885

E-mail: sales@envi-ees.com

Certificate No. : E22-11049

Page : 1 of 2

CERTIFICATE OF CALIBRATION

Customer : Safety Plan Co., Ltd.

Address : 1034 Moo 3, Rang sit-Pathum Thani Rd., T. Bangpoon, A. Muang,
Pathum Thani 12000

Description of Equipment : Nozzle

Manufacturer : Apex Instrument

Model Number : NS SET

Serial Number : -

ID./Control No. : -

Environment Conditions : **Temperature** (25 ± 2) °C
: **Humidity** (50 ± 15) % RH

Cal. Date : 26/10/2022

Issue Date : 26/10/2022

Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)


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

Result of Calibration

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These reported uncertainties of measurement are expanded by a coverage factor of k=2, providing a 95% confidence level

Calibrated by : Mr. Sanya Sangnil

Approved by : 
(Mr. Mana Fuekhud)
Technical Manger



CALIBRATION RESULTS

Sampling System Equipment Information

Nozzle Model : NS SET
Nozzle Number : -
Nozzle Type : Stainless Steel

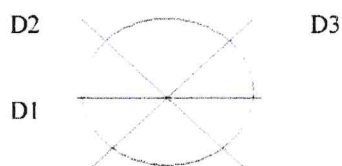
Calibration Condition

Date : 26 October 2022
Barometric Pressure : 760.49 mm Hg
Calibration Device : Vernier, 0-150 mm
Method Reference : US. EPA Method

Nozzle ID	Nozzle Diameter				Different	(D1 + D2 + D3) / 3
Size		D1	D2	D3	ΔD	Davg
	mm	mm	mm	mm	mm	mm
NS-4	3.18	3.08	3.09	3.07	0.010	3.080
NS-6	4.76	4.74	4.72	4.72	0.012	4.727
NS-8	6.35	6.41	6.39	6.40	0.010	6.400
NS-16	12.70	11.94	11.95	11.93	0.010	11.940

Remark:

D1, D2, D3 = There difference nozzle diameters, mm; diameter must be within 0.025 mm
 ΔD = Maximum difference between any two diameters, must be ≤ 0.100 mm
 Davg = $(D_1 + D_2 + D_3) / 3$





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 21TM1547

Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter with Sensor
Manufacturer : Eutech
Model : pH 700
Serial No. : 2858459
ID No. : LB-Eq-027
Submitted by : Special Lab Envi And Consultant Co.,Ltd.
47/91-93 Moo 3 Thambon Tha-it,
Pakkret,
Nonthaburi 11120
Location : TPA Chemistry Calibration Laboratory
Received Order : 23 August 2021
Calibrated Date : 27 August 2021
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$
AC Line Voltage : $(220 \pm 22) \text{ V}$
Calibrated by : Kunchit Promprat

Approved by :

Malee

Approved Signatory

(/) Pornthippa Tameyakul
(✓) Malee Butkruea
() Suwit Imjai

Issue Date : 31 August 2021

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0031535



Equipment : pH Meter with Sensor
Condition As-Received : Used Item
Reference : 2108-0663WN-2

Cert. No.: 21TM1547
Page.: 2 of 2

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Digital Thermometer	1523	2188080	2011389	20 Nov 2021

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

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

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, ID No.: SL-33/1

<u>Calibration Point</u> (°C)	<u>Immersion Depth</u> (mm)	<u>Standard Temperature</u> (°C)	<u>UUC* Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (±°C)	<u>Coverage Factor</u> <i>k</i>
25.0	100	25.0	25.000	0.000	0.16	2.00

UUC* : Unit Under Calibration

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

-o0o-

Maku.

a 1069519



BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY

300 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2929 Fax: +66 2615-2350-1
E-mail: bkk@becthai.com Website: www.becthai.com



Certificate No. : CAL-21-517

Page : 1 of 3

CERTIFICATE OF CALIBRATION

Equipment	:	Spectrophotometer
Manufacturer	:	Merk
Model	:	Prove 100
Serial No.	:	1809112938
ID No.	:	N/A
Customer	:	Special Lab Envi And Consultant Co., Ltd.
	:	47/91 Moo 3, Tambol Tait ,
	:	Amphur Pakrad, Nonthaburi, 11120.
Location	:	Becthai Laboratory
Date of Receipt	:	21 August 2021
Date of Calibration	:	21 August 2021
Date of Issue	:	21 August 2021
Ambient Temperature	:	(25±10) °C
Relative Humidity	:	(60±20) %
Condition As-Received	:	Used Item

Calibrated by

Kittikorn Boonprapai

(Mr. Kittikorn Boonprapai)

Calibration Engineer

Approved by

Jintana Sangthaijaroenlap

(Ms. Jintana Sangthaijaroenlap)

Calibration Manager

The reported expended uncertainty of measurement was based on a combined standard uncertainty multiplied by a coverage factor $k=2.00$, providing a level of confidence of approximately 95%.

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Indicated values are valid for the state of the Spectrophotometer at the time of calibration only.



BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY

300 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2929 Fax: +66 2615-2350-1
E-mail: bkk@becthai.com Website: www.becthai.com



Certificate No. : CAL-21-517

Page : 2 of 3

CALIBRATION REPORT

Conditions of this result of calibration

1. Reference Standard Material :

<u>Material</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert.No.</u>	<u>Due date</u>
Holmium Glass Filter	RM-HG	24563	90313	2 Mar 23
Neutral Density Filter	RM-1N2N3N	24568	90324	3 Mar 23

2. Traceability : This certification is traceable to the International System of Unit maintained at;
The Starna Scientific Ltd. Accredited Calibration Laboratory No. 0659.

3. Method of calibration :

The calibration procedure was carried out according to the Guide to CPM-CAL-02 based on ASTM E275-08 (2013) and-
ASTM E925-09 (2014).

4. Result of calibration :

(☒) without adjustment

(☐) after adjustment

5. Equipment Specifications:

Spectral Bandwidth :	4	nm
Data Interval :	0.1	nm
Scan Speed :	N/A	nm/min



BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY

300 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2929 Fax: +66 2615-2350-1
E-mail: bkk@becthai.com Website: www.becthai.com



Certificate No. : CAL-21-517

Page : 3 of 3

CALIBRATION REPORT

Wavelength Calibration

Certified Values of Reference Material (nm)	Nominal Value (nm)	UUC*Reading (nm)	Error (nm)	Uncertainty of Measurement (\pm nm)
418.48	418.48	418.4	-0.08	0.13
536.90	536.90	534.3	-2.60	0.27
637.94	637.94	636.1	-1.84	0.17

Photometric Calibration for Visible

Wavelength (nm)	Certified Values of Reference Material (A)	UUC* Reading (A)	Error (A)	Uncertainty of Measurement (\pm A)
420.0	Zero	0.000	0.0000	0.0028
	0.5824	0.580	-0.0024	0.0044
	0.7266	0.721	-0.0056	0.0041
	1.0377	1.029	-0.0087	0.0040
440.0	Zero	0.000	0.0000	0.0028
	0.5659	0.559	-0.0069	0.0043
	0.7126	0.710	-0.0026	0.0038
	1.0172	1.013	-0.0042	0.0038
465.0	Zero	0.000	0.0000	0.0028
	0.5256	0.522	-0.0036	0.0044
	0.6705	0.673	0.0025	0.0036
	0.9562	0.958	0.0018	0.0035
546.1 (546.0)	Zero	0.000	0.0000	0.0028
	0.5236	0.520	-0.0036	0.0036
	0.6962	0.695	-0.0012	0.0031
	0.9933	0.991	-0.0023	0.0033
590.0	Zero	0.000	0.0000	0.0028
	0.5578	0.557	-0.0008	0.0036
	0.7523	0.752	-0.0003	0.0032
	1.0747	1.072	-0.0027	0.0033
635.0	Zero	0.000	0.0000	0.0028
	0.5655	0.565	-0.0005	0.0036
	0.7321	0.731	-0.0011	0.0032
	1.0454	1.043	-0.0024	0.0031

Remark : Each individual filter is measured against the empty filter holder (blank) used to zero the Spectrophotometer.

Note:

UUC* : Unit Under Calibration

- End of Report -



PinAAcle 900F Preventive Maintenance Report

Company Name: SPECIAL LAB ENVI & CONSULTANT


Instrument Location: PAKKRET NONTHABURI 11120

Instrument Serial No.: PFBS17082303

Date: 03-Sep-2021

PinAAcle 900F Preventive Maintenance (PM)

Company Name:	SPECIAL LAB ENVI & CONSULTANT		
Address (Instrument Location):	PAKKRET NONTABURI 11120		
Serial Number:	PFBS17082303	PM Number:	1 of 1
Customer Name (if applicable):	K. Fhatiha	Telephone Number:	(092) 283-9054
Customer Support Engineer Name:	K. Weerayoot keadpon	Service Order Number:	WO-00925451
Date PM Performed: (DD-MMM-YYYY)	03-Sep-2021	Next PM Due Date: (DD-MMM-YYYY)	03-Sep-2022
Standard Labor Hours to Complete PM :		5 hours	

Part Number	Release	Publication Date	
09370145 Rev.9	A	January 2018	

Scope

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900F by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	1
N3160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	2
N9301714	Replacement Acetylene Filter Cartridge	1
TH001022	Replacement Air Filter Cartridge	2

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300183	1000 mg/L Copper Standard	AR	25-20CUY1	30-Jan-2022

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 ml.	AR	AR
N/A	0.5% HNO ₃	250 ml.	AR	AR

Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	5503530856
N1013002	1.0A Neutral density filter	1	5503555491
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	021913-020070
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☒ Clean exterior of the instrument.
- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C₂H₂ and N₂O-C₂H₂ flames (if applicable).

4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect optics. Clean or replace if necessary,

6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
C ₂ H ₂ Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

8. After PM Performance tests:

8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	0.9798	0.9766	Passed
0.2 A ND Filter	± 5% from Cert.	0.2042	0.1989	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0015	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0002	Passed

8.4 D₂ Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0079	Passed

8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0004	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0011	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	NA	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3221	Passed

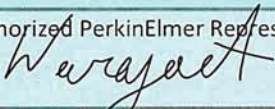
10. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM

Review

<p><i>The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.</i></p>	
<p><i>This PinAAcle 900F Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.</i></p>	
<p>Review of Preventive Maintenance:</p>	
<p>Authorized PerkinElmer Representative:</p> 	<p>Date:</p> <p>03-Sep-2021</p> <p>(DD-MMM-YYYY)</p>
<p>Authorized Customer Representative:</p>	<p>Date:</p> <p>(DD-MMM-YYYY)</p>



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CH1158

Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Eutech
Model : pH 700
Serial No. : 2858459
ID No. : LB-Eq-027
Condition As-Received: Used Item
Received Date : 31 August 2022
Calibration Date : 01 September 2022
Reference : 2208-1091WN-1
Submitted by : Special Lab Envi And Consultant Co.,Ltd
47/91-93 Moo 3 Thambon Tha-it,
Pakkret Nonthaburi 11120
Ambient Temperature : (25 \pm 2.5) °C
Relative Humidity : (50 \pm 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement
with certified reference material (CRM)

Calibrated by : Warakorn Lernagtrakul

Approved by :

Approved Signatory

- (☒) Malee Butkruea
() Saithip Meangmai
() Warakorn Lernagtrakul

Issue Date : 6 September 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0044873



Cert. No.: 22CH1158

Page.: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument : -

<u>Instrument</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Document Process Calibrator	43160066	130RC092	22E1223	13 Apr 2023

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

- Traceable to National Institute of Metrology (Thailand), NIMT

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

<u>Buffer Solution</u>	<u>Manufacturer</u>	<u>Lot No.</u>	<u>Exp. date</u>
pH 4.008	CPA chem	794120	14 Feb 2024
pH 6.985	CPA chem	794122	14 Feb 2023
pH 10.008	CPA chem	823323	20 June 2023

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

Calibration Results**Function : mV Measurement**

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor <i>k</i>
	pH	mV	mV	pH		
pH Meter S/N.: 2858459	4.00	177.48	177.4	4.01	0.058	2.00
	6.86	8.28	8.3	6.86	0.058	2.00
	7.00	0.00	0.1	7.00	0.058	2.00
	9.18	-128.97	-128.9	9.19	0.058	2.00
	10.00	-177.48	-177.4	10.01	0.058	2.00

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor <i>k</i>
pH Electrode S/N.: 3101624	4.008	4.01	177.4	0.0085	2.05
	6.985	6.99	3.0	0.0099	2.00
	10.008	10.01	-169.4	0.0092	2.00

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

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Cert. No.: 22LM126

Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter with Sensor

Manufacturer : Eutech

Model : pH 700

Serial No. : 2858459

ID No. : LB-Eq-027

Submitted by : Special Lab Envi And Consultant Co.,Ltd
47/91-93 Moo 3 Thambon Tha-it,
Pakkret Nonthaburi 11120

Location : Chemistry Calibration Lab.2

Received Order : 31 August 2022

Calibrated Date : 1 September 2022

Ambient Temperature : (26 ± 10) °C

Relative Humidity : (50 ± 30) %

AC Line Voltage : (220 ± 22) V

Calibrated by : Warakorn Lerngagtrakul

Approved by :

Malee

Approved Signatory

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

Issue Date :

6 September 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0044921



Equipment : pH Meter with Sensor

Condition As-Received : Used Item

Reference : 2208-1091WN-2

Cert. No.: 22LM126

Page.: 2 of 2

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Digital Thermometer	53 II B	20410013	22I555	06 May 2023

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

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

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: PH5TEMB01P

<u>Calibration Point</u> (°C)	<u>Immersion Depth</u> (mm)	<u>Standard Temperature</u> (°C)	<u>UUC* Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (± °C)	<u>Coverage Factor</u> <i>k</i>
25.0	80	25.004	25.0	-0.004	0.16	2.00

UUC* : Unit Under Calibration

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

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Certificate of Calibration

Certificate No. : 65-400451-1

Page : 1 of 2

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

Equipment : Water Bath

Manufacturer : Memmert

Model : WNB22

Range : N/A °C

Resolution : 0.1 °C

Serial No. : L520.0201

ID No. : LB-Eq-041

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

Ambient Temperature : (31.0 to 33.0) °C

Relative Humidity : (45 to 500) %

Line Voltage : (226.0 to 226.5) V

Date of Received : 24 August 2022

Date of Calibration : 24 August 2022

Date of Issue : 31 August 2022

Calibrated by : Permpon Chanpu

Calibration Method : This instrument was calibrated by In-house method CAL-M4006 based on ASTM E715-80
The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units
Standard Digital Thermometer with RTD probe

ID No.	Cert. No.	Due Date	Traceability
400029 & 400031	65-400273-1	23 Nov 2022	National Institute of Metrology Thailand (NIMT)

Approved by :

(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

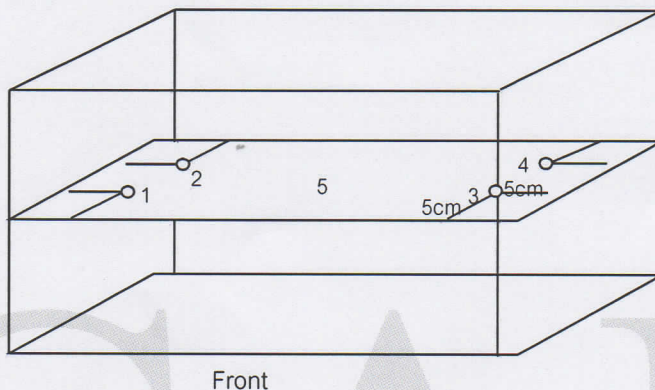
Certificate No. : 65-400451-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement



Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.					Uncertainty (± °C)	Measured Uniformity (°C)	Measured Stability (°C)
			1	2	3	4	5			
62.0	62.0	62.0	61.93	61.92	61.91	61.91	61.91	0.18	0.06	0.03
85.0	85.0	85.0	84.94	84.91	84.89	84.92	84.92	0.18	0.08	0.03
95.0	95.0	95.0	94.81	94.76	94.76	94.77	94.77	0.19	0.09	0.07
100.0	ccc	100.8	100.64	100.74	100.52	100.62	100.56	0.24	0.34	0.13

Remark The uncertainty is not combine uniformity of the water bath

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

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

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Handwritten signature



Certificate of Calibration

Certificate No. : 65-210421-1

Page : 1 of 2

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

Equipment : Weight
Manufacturer : LS Material : Stainless Steel
Weight size : 1 g
ID No. : LB-Eq-034
Assumed density of weight : 7950 kg / m³
Assumed Air density : 1.2 kg / m³

Environment : Ambient Temperature : (20 ± 2) °C
Relative Humidity : (50 ± 10) %
Air Pressure : 1009.8 mbar

Date of Received : 01 September 2022

Date of Calibration : 05 September 2022

Date of Issue : 05 September 2022

Calibrated by : Wuttichai Swatphong

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

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

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E221-E2210	MM-0042-22	21 Mar 2025	National Institute of Metrology (Thailand), (NIMT)

Approved by :



(Surachai Promthong)

Laboratory Manager

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Certificate of Calibration

Certificate No. : 65-210421-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

No.	Nominal Value	Id.Mark	Conventional mass Value		Measuring Uncertainty
1	1 g	none	1 g	-0.028 mg	\pm 0.023 mg

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

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

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Certificate of Calibration

Certificate No. : 65-210421-2

Page : 1 of 2

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

Equipment : Weight
Manufacturer : LS Material : Stainless Steel
Weight size : 100 g
ID No. : LB-Eq-035
Assumed density of weight : 7950 kg / m³
Assumed Air density : 1.2 kg / m³

Environment : Ambient Temperature : (20 ± 2) °C
Relative Humidity : (50 ± 10) %
Air Pressure : 1009.8 mbar

Date of Received : 01 September 2022

Date of Calibration : 05 September 2022

Date of Issue : 05 September 2022

Calibrated by : Wuttichai Swatphong

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

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

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E221-E2210	MM-0042-22	21 Mar 2025	National Institute of Metrology (Thailand), (NIMT)

Approved by :



(Surachai Promthong)

Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 65-210421-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

No.	Nominal Value	Id.Mark	Conventional mass Value		Measuring Uncertainty
1	100 g	none	100 g	-0.05 mg	\pm 0.11 mg

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

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

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Certificate of Calibration

Certificate No. : 65-210421-3

Page : 1 of 2

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

Equipment : Weight
Manufacturer : LS Material : Stainless Steel
Weight size : 200 g
ID No. : LB-Eq-036
Assumed density of weight : 7950 kg / m³
Assumed Air density : 1.2 kg / m³

Environment : Ambient Temperature : (20 ± 2) °C
Relative Humidity : (50 ± 10) %
Air Pressure : 1009.8 mbar

Date of Received : 01 September 2022

Date of Calibration : 05 September 2022

Date of Issue : 05 September 2022

Calibrated by : Wuttichai Swatphong

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

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

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E221-E2210	MM-0042-22	21 Mar 2025	National Institute of Metrology (Thailand), (NIMT)

Approved by :



(Surachai Promthong)
Laboratory Manager

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Certificate of Calibration

Certificate No. : 65-210421-3

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

No.	Nominal Value	Id.Mark	Conventional mass Value		Measuring Uncertainty
1	200 g	none	200 g	+0.09 mg	\pm 0.17 mg

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

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

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BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY

300 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2929 Fax: +66 2615-2350-1
E-mail: bkk@becthai.com Website: www.becthai.com



Certificate No. : CAL-22-614

Page : 1 of 3

CERTIFICATE OF CALIBRATION

Equipment	:	Spectrophotometer
Manufacturer	:	Merck
Model	:	Prove 100
Serial No.	:	1809112938
ID No.	:	LB-Eq-031
Customer	:	Special Lab Envi And Consultant Co., Ltd.
	:	47/91-93 Moo 3, Tambol Tait,
	:	Amphur Pakrad, Nonthaburi, 11120
Location	:	Becthai Laboratory
Date of Receipt	:	17 August 2022
Date of Calibration	:	17 August 2022
Date of Issue	:	17 August 2022
Ambient Temperature	:	(25±10) °C
Relative Humidity	:	(60±20) %
Condition As-Received	:	Used Item

Calibrated by

(Ms. Nopparat Suntarotayan)

Calibration Engineer

Approved by

(Ms. Jintana Sangthaijaroenlap)

Calibration Manager

The reported expended uncertainty of measurement was based on a combined standard uncertainty multiplied by a coverage factor $k=2.00$, providing a level of confidence of approximately 95%.

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Indicated values are valid for the state of the Spectrophotometer at the time of calibration only.



BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY

300 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2929 Fax: +66 2615-2350-1
E-mail: bkk@becthai.com Website: www.becthai.com



Certificate No. : CAL-22-614

Page : 2 of 3

CALIBRATION REPORT

Conditions of this result of calibration

1. Reference Standard Material :

<u>Material</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert.No.</u>	<u>Due date</u>
Holmium Glass Filter	RM-HG	24563	90313	2 Mar 23
Neutral Density Filter	RM-1N2N3N	24568	90324	3 Mar 23

2. Traceability : This certification is traceable to the International System of Unit maintained at;

The Starna Scientific Ltd. Accredited Calibration Laboratory No. 0659.

3. Method of calibration :

The calibration procedure was carried out according to the Guide to CPM-CAL-02 based on ASTM E275-08 (2013) and-
ASTM E925-09 (2014).

4. Result of calibration :

(☒) without adjustment

(☐) after adjustment

5. Equipment Specifications:

Spectral Bandwidth :	4	nm
Data Interval :	1	nm
Scan Speed :	N/A	nm/min



BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY

300 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2929 Fax: +66 2615-2350-1
E-mail: bkk@becthai.com Website: www.becthai.com



Certificate No. : CAL-22-614

Page : 3 of 3

CALIBRATION REPORT

Wavelength Calibration

Certified Values of Reference Material (nm)	Nominal Value (nm)	UUC*Reading (nm)	Error (nm)	Uncertainty of Measurement (\pm nm)
418.48	418.48	418	-0.48	0.59
536.90	536.90	536	-0.90	0.59
637.94	637.94	638	0.06	0.59

Photometric Calibration for Visible

Wavelength (nm)	Certified Values of Reference Material (A)	UUC* Reading (A)	Error (A)	Uncertainty of Measurement (\pm A)
420.0	Zero	0.000	0.0000	0.0028
	0.5824	0.583	0.0006	0.0044
	0.7266	0.726	-0.0006	0.0041
	1.0377	1.036	-0.0017	0.0040
440.0	Zero	0.000	0.0000	0.0028
	0.5659	0.566	0.0001	0.0042
	0.7126	0.712	-0.0006	0.0038
	1.0172	1.015	-0.0022	0.0037
465.0	Zero	0.000	0.0000	0.0028
	0.5256	0.526	0.0004	0.0044
	0.6705	0.670	-0.0005	0.0035
	0.9562	0.956	-0.0002	0.0035
546.1 (546.0)	Zero	0.000	0.0000	0.0028
	0.5236	0.523	-0.0006	0.0036
	0.6962	0.695	-0.0012	0.0032
	0.9933	0.990	-0.0033	0.0033
590.0	Zero	0.000	0.0000	0.0028
	0.5578	0.557	-0.0008	0.0036
	0.7523	0.751	-0.0013	0.0032
	1.0747	1.071	-0.0037	0.0033
635.0	Zero	0.000	0.0000	0.0028
	0.5655	0.565	-0.0005	0.0036
	0.7321	0.731	-0.0011	0.0031
	1.0454	1.042	-0.0034	0.0031

Remark : Each individual filter is measured against the empty filter holder (blank) used to zero the Spectrophotometer.

Note:

UUC* : Unit Under Calibration

- End of Report -

PinAAcle 900F Preventive Maintenance Report

Company Name: SPECIAL LAB ENVI & CONSULTANT

Instrument Location: 47/91 หมู่ 3 หมู่บ้านที่แลนค์


ต.ท่าอิฐ. อ.ปากเกร็ดจ.นนทบุรี 11120

Instrument Serial No.: PFBS17082303

Date: 06-Sep-2022

PinAAcle 900F Preventive Maintenance (PM)

Company Name:	SPECIAL LAB ENVI & CONSULTANT		
Address (Instrument Location):	47/91 หมู่ 3 หมู่บ้านที่แลนค์ ต.ท่าอิฐ อ.ปากเกร็ด จ.นนทบุรี 11120		
Serial Number:	PFBS17082303	PM Number:	1/1
Customer Name (if applicable):	-	Telephone Number:	-
Customer Support Engineer Name:	Pattrayut W.	Service Order Number:	WO-01892933
Date PM Performed: (DD-MMM-YYYY)	Sep 6, 2022	Next PM Due Date: (DD-MMM-YYYY)	Sep 6, 2023
Standard Labor Hours to Complete PM :		5 hours	

Part Number	Release	Publication Date	
09370145 Rev.9	A	January 2018	

Scope

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900F by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	2
N3160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	2
N9301714	Replacement Acetylene Filter Cartridge	1
TH001022	Replacement Air Filter Cartridge	2

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300183	1000 mg/L Copper Standard	AR	25-76CUY1	30-Oct-2022

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 ml.	AR	AR
N/A	0.5% HNO ₃	250 ml.	AR	AR

Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	MG0-056
N1013002	1.0A Neutral density filter	1	MG2-258
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	03030997
N3050121	Cu Lumina HCL	1	092216-010130
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☒ Clean exterior of the instrument.
- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C₂H₂ and N₂O-C₂H₂ flames (if applicable).

4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect optics. Clean or replace if necessary,

6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
C ₂ H ₂ Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

8. After PM Performance tests:

8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	1.0309	0.9928	Passed
0.2 A ND Filter	± 5% from Cert.	0.1857	0.1869	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0008	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0001	Passed

8.4 D₂ Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.010	Passed

8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0003	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0012	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	N/A	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3347	Passed

10. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM

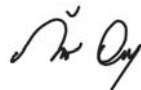
Review

The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.

This PinAAcle 900F Passes ☒ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:



Date:

06-Sep-2022

(DD-MMM-YYYY)

Authorized Customer Representative:



Date:

06-Sep-2022

(DD-MMM-YYYY)

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0279

MTC No. EEL. BP. 120/0165

CALIBRATION CERTIFICATE

Submitted by : SAFETY PLAN CO., LTD.

Address : 1034 Moo 3 Rangsit-pathumthani Rd., Tambol Bangpoo, Amphur Maung Pathumthani 12000.

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

Instrument Calibrated :

Description : Sound Level Calibrator

Manufacturer : Rion

Model : NC-73

Serial No. : 10848247

Ambient Environment

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

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

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

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

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

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

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

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

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

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

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

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

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

Date of Receipt : 28 Jan. 2022

Date of Calibration : 8 Feb. 2022

1 / 2 1

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

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

FM.BL.MTC.002 Rev.4

Head Office

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E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

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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)

Request No. 21-65/0279

MTC No. EEL. BP. 120/0165

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

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	94.26	0.26	± 0.10	± 0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	998.7	-1.3	± 1.5	$\pm 2.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1.95	± 0.50	$\pm 4.0\%$

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

Calibrated by :



(Mr.Tawikiat Iamsamran)

Approved by :


(Mr.Prawate Klaiyapa)
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 8 Feb. 2022

Date of Issue : 9 Feb. 2022

Ref : 2011265012800389002

2 / 2

End of Certificate

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

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FM.BL.MTC.002 Rev.4

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E-mail : sumalee@tistr.or.th



Safety Plan Co., Ltd.

บริษัท เซฟตี้ แพลน จำกัด

1034 หมู่ 3 ถนนรังสิต-ปทุมธานี ตำบลบางคูเวียง อำเภอเมือง จังหวัดปทุมธานี 12000 โทรศัพท์ 0-2567-3549 โทรสาร 0-2567-3485
1034 Moo 3 Rangsit-Pathum Thani Rd. Tambon Bangkueon, Amphur Muang, Pathum Thani 12000 Tel. 0-2567-3549 Fax 0-2567-3485

Calibration Sound Level Meter Certificate

Date of Calibration : February 9, 2022

Condition of Calibration

Temperature : ($^{\circ}\text{C}$) 25 ± 2 Humidity : (%RH) 50 ± 10
Ambient Pressure : 758.8 mmHg

Signal Level Adjustment

Level Range : 60-120 dB Time Weighting : Slow
Frequency Weighting : C Acoustic Calibrator : 114.0 dB

Reference Equipment

Sound Level Calibrator Quest Technologies

Model : NC-73 Serial No. : 10848247
Reference No. : MTC No. EEL.BP. 38/0264 (TISTR)
Calibration Date : February 8, 2022
Integrating Sound Level Meter : PICCOLO

Intergrating Sound Level Meter	Reading (dB)	Error (dB)	Adjustment
SLM (A1) PICCOLO S/N 150217021	113.9	-0.2	Adjusted +0.1 to 114.0
SLM (A2) PICCOLO S/N 150217004	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (A3) PICCOLO S/N 150217022	113.9	0.1	Adjusted +0.1 to 114.0
SLM (A4) PICCOLO S/N 150217008	113.9	0.1	Adjusted +0.1 to 114.0
SLM (A5) PICCOLO S/N 150217014	113.9	0.1	Adjusted +0.1 to 114.0
SLM (A6) PICCOLO S/N 160721003	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (A7) PICCOLO S/N 160721002	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (A8) PICCOLO S/N 160721011	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (A9) PICCOLO S/N 160721001	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (P1) PICCOLO S/N 150324051	113.9	0.1	Adjusted +0.1 to 114.0
SLM (P2) PICCOLO S/N 150324062	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (P3) PICCOLO S/N 121018012	113.9	0.1	Adjusted +0.1 to 114.0
SLM (P4) PICCOLO S/N 150324047	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (P5) PICCOLO S/N 170808016	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (P6) PICCOLO S/N 130927047	113.9	-0.2	Adjusted +0.1 to 114.0

Calibrated By : ชวัลลภ อ่อนไฉ่
(Mr. Chawwalit Onswai)

Approve By : นารองศักดิ์ เสริพานิตกาม
(Mr. Narongsak Seripanitkarn)



High Volume Sampler Calibration

CONDITIONS

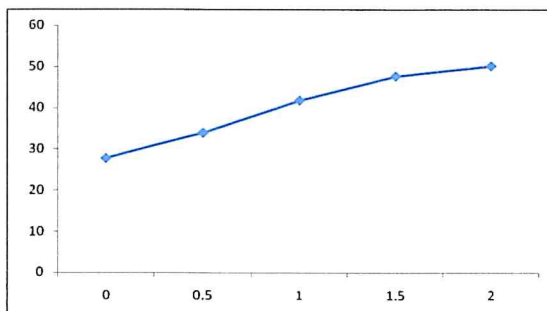
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Average Press. (mm Hg)	:	752.80	Corrected Average (mm Hg)	:	753
Average Temp. (deg C)	:	31	Average Temp. (deg K)	:	304

CALIBRATION ORIFICE

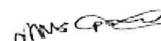
Make	:	General Metal Works	Qstd Slope	:	1.89677
Model	:	GMW	Qstd Intercept	:	-0.02329
Serial #	:	F36	Date Certified	:	January 18, 2022

CALIBRATIONS

Plate or	H2O	Qstd	I	IC	LINEAR	
Test #	(in)	(m3/min)	(Chart)	(Corrected)	REGRESSION	
15	9.20	1.587	52.5	51.69	Slope	= 30.0359
13	7.60	1.443	48.5	47.75	Intercept	= 4.4591
10	5.22	1.198	42.5	41.84	Corr. Coeff.	= 0.9976
7	3.42	0.972	34.0	33.48		
5	2.20	0.782	28.5	28.06	# of Observations	: 5
Range of Chart						37
at 1.1-1.7 m3/min						56



Calibrated By :



Mr. PASAGORN SAMOL



บริษัท เอ็นไวร์ เซอร์วิส จำกัด

บริษัท เอ็นไวร์ เซอร์วิส จำกัด
ENVIR SERVICE CO., LTD.

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: CO Analyzer Model: 300	Manufacturer API S/N: 1306
--	-------------------------------

Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 45.2 PPM SO2 Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022

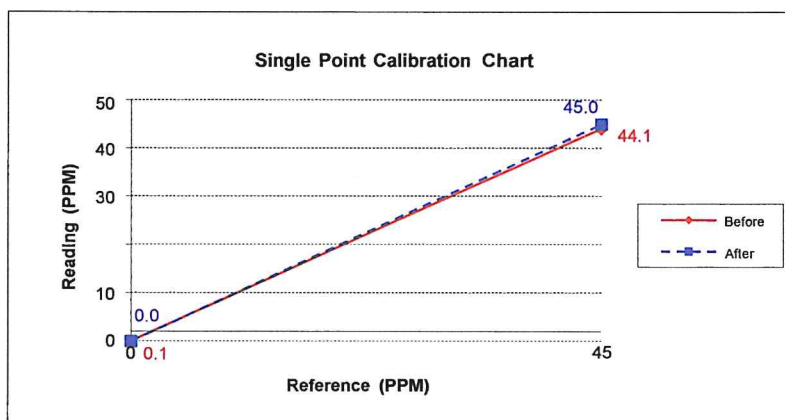
Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.1	-2.0
After	0.0	0.0	0.0	45.0	45.0	0.0

20



Calibrate By :



บริษัท เอ็นไวร์ เซอร์วิส จำกัด
ENVIR SERVICE CO., LTD.

บริษัท เอ็นไวร์ เซอร์วิส จำกัด

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

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

Analyzer Performance Test

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: CO Analyzer Model: 300	Manufacturer API S/N: 1371
--	-------------------------------

Calibration System

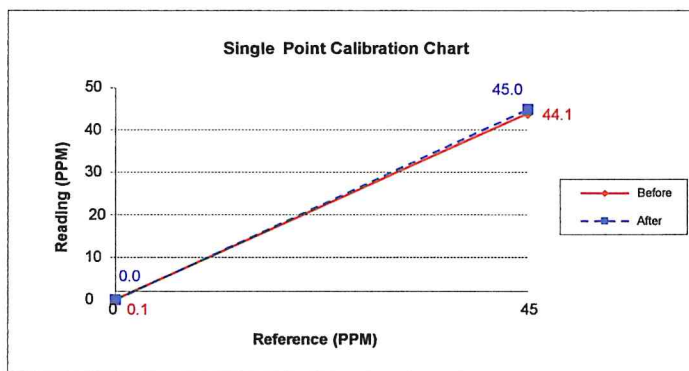
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 45.2 PPM SO2 Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.1	-2.0
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By:

Mr. PASAGORN SAMOL



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ENVIR SERVICE CO., LTD.

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel ; 02-9435814-5 Fax ; 02-9438201

Analyzer Performance Test

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: CO Analyzer Model: 48C	Manufacturer Thermo Environmental S/N: 48C-65775-350
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Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 45.2 PPM SO2 Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022

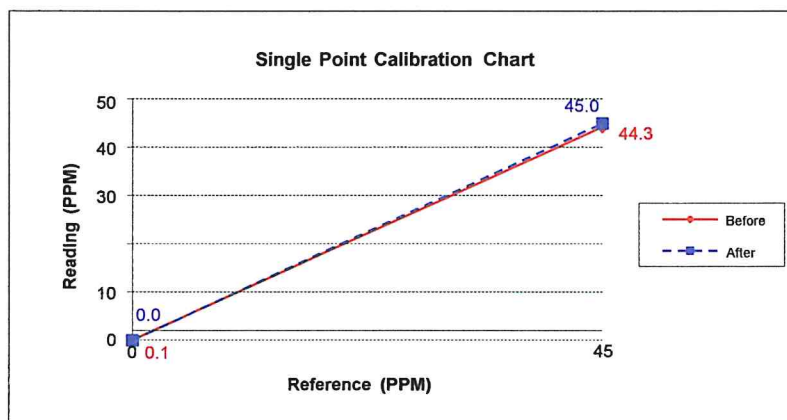
Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.3	-1.6
After	0.0	0.0	0.0	45.0	45.0	0.0

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Calibrate By :

Mr. PASAGORN SAMOL



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

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: CO Analyzer Model: 300	Manufacturer API S/N: 1307
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Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 45.2 PPM SO2 Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022

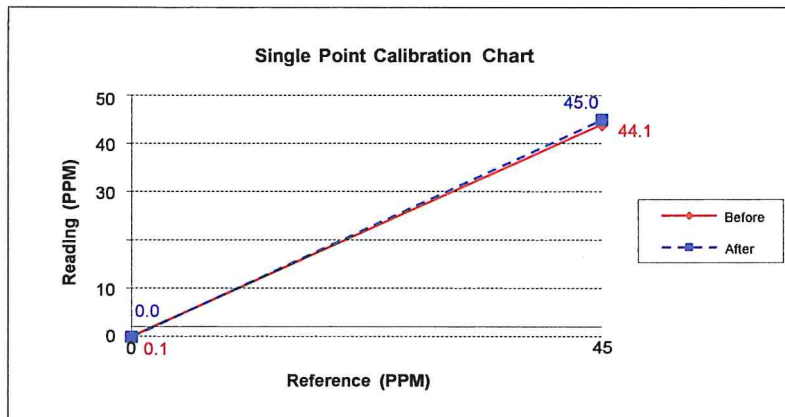
Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.1	-2.0
After	0.0	0.0	0.0	45.0	45.0	0.0

20



Calibrate By :

Analyzer Performance Test

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: SO2 Analyzer Model: 43C	Manufacturer Thermo Environmental S/N: 43C-53168-294
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Calibration System

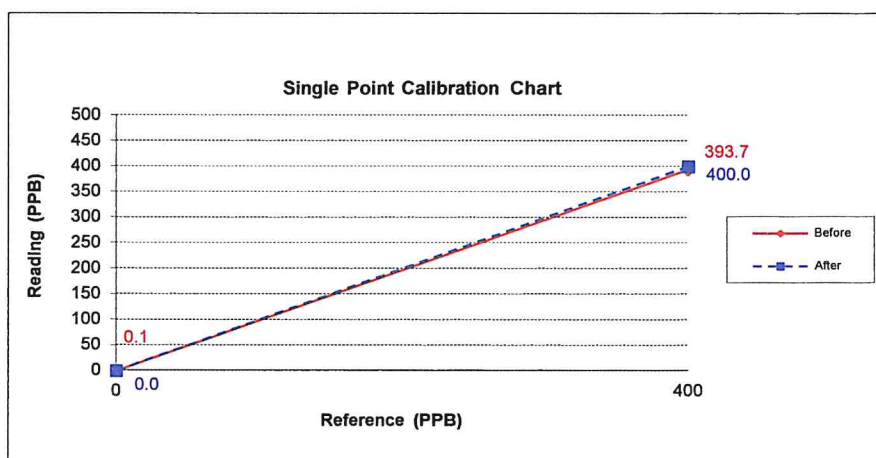
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 45.2 PPM SO2 Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	393.7	-1.6
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

Mr.PASAGORN SAMOL

Analyzer Performance Test

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: SO2 Analyzer Model: 43C	Manufacturer Thermo Environmental S/N: 43C-73377-373
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Calibration System

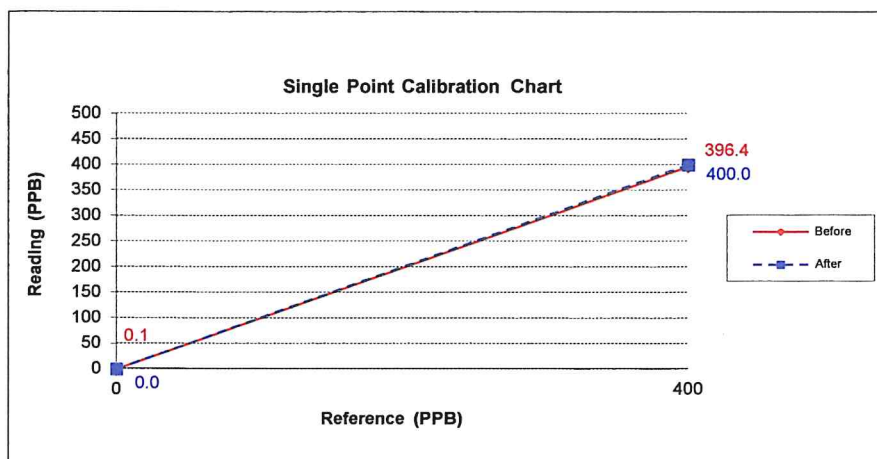
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 45.2 PPM SO2 Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	396.4	-0.9
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

Mr.PASAGORN SAMOL

Analyzer Performance Test

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: SO2 Analyzer	Manufacturer Thermo Environmental
Model: 43C	S/N: 43C-62237-334

Calibration System

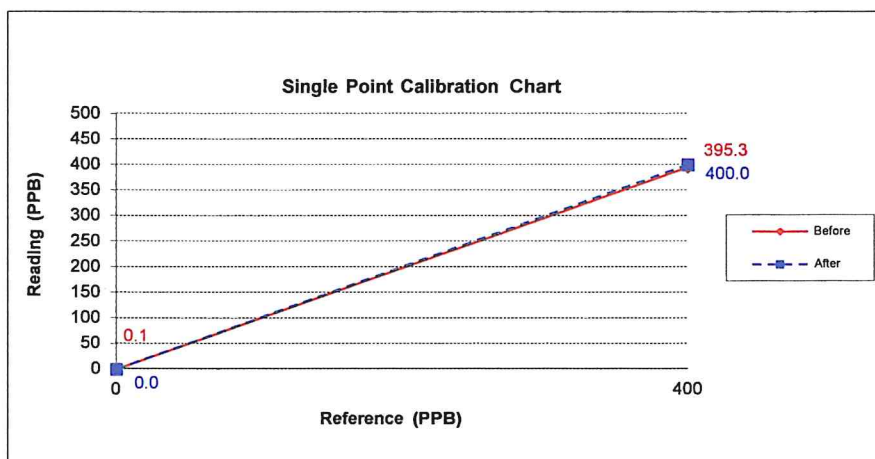
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705	NO Conc 45.2 PPM SO2 Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022
ZERO AIR Generator API MODEL 701 S/N: 1924	

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	395.3	-1.2
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

Mr.PASAGORN SAMOL

Analyzer Performance Test

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: SO ₂ Analyzer Model: 43C	Manufacturer Thermo Environmental S/N: 43C-53168-300
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Calibration System

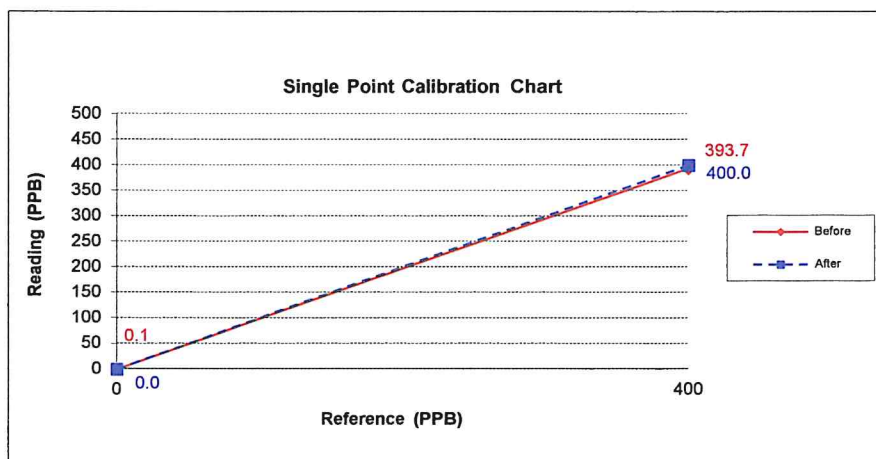
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 45.2 PPM SO ₂ Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	393.7	-1.6
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

Mr.PASAGORN SAMOL



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42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: 42C	Manufacturer Thermo Environmental S/N: 42CLS-76495-383
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Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1924	NO Conc 45.2 PPM SO ₂ Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022

Environment: Temperature 25.5 °C

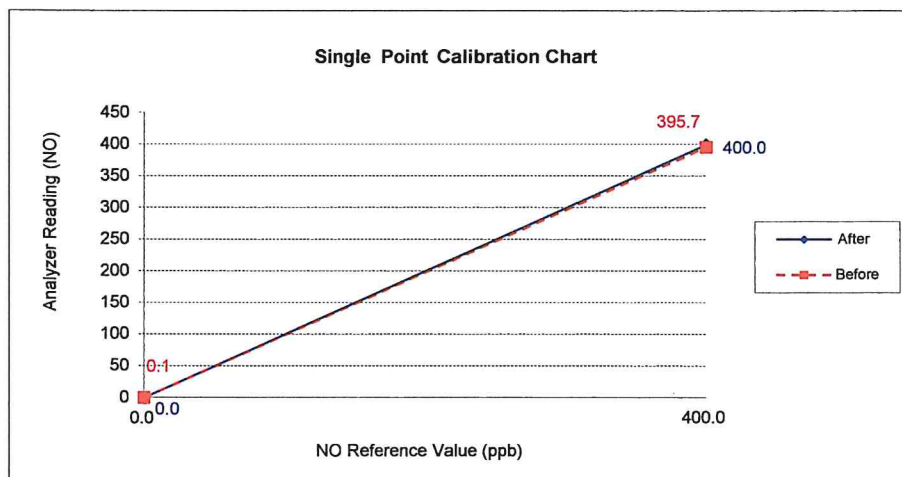
Humidity: 51 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	395.7	400.0	-1.1
NO _x	0.1	0.0	0.1	400.0	400.0	0.0

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NO _x	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By : Mr. Pasagorn Samol



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42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: 42C	Manufacturer Thermo Environmental S/N: 70968-367
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Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1924	NO Conc 45.2 PPM SO ₂ Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022

Environment: Temperature 25.5 °C

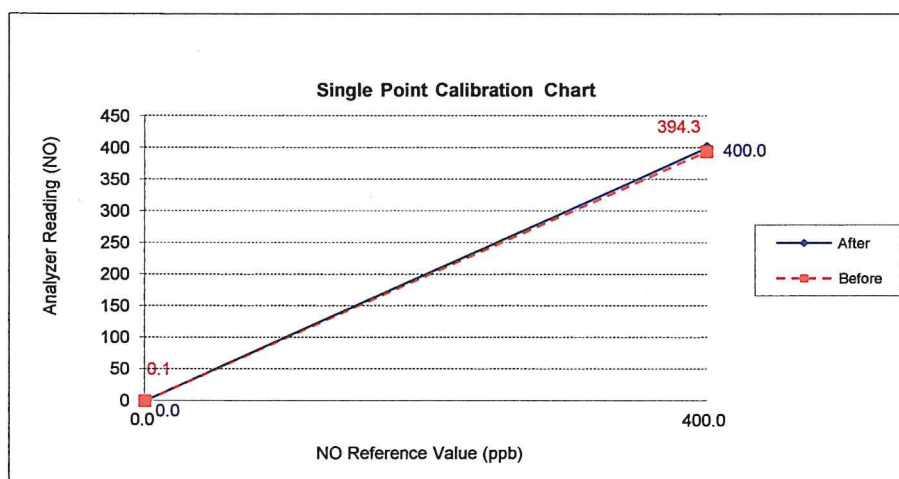
Humidity: 51 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	394.3	400.0	-1.4
NO _x	0.1	0.0	0.1	400.0	400.0	0.0

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NO _x	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By : Mr. Pasagorn Samol



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

Analyzer Performance Test

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: 42C	Manufacturer Thermo Environmental S/N: 0508011077
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Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1924	NO Conc 45.2 PPM SO ₂ Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022

Environment: Temperature 25.5 °C

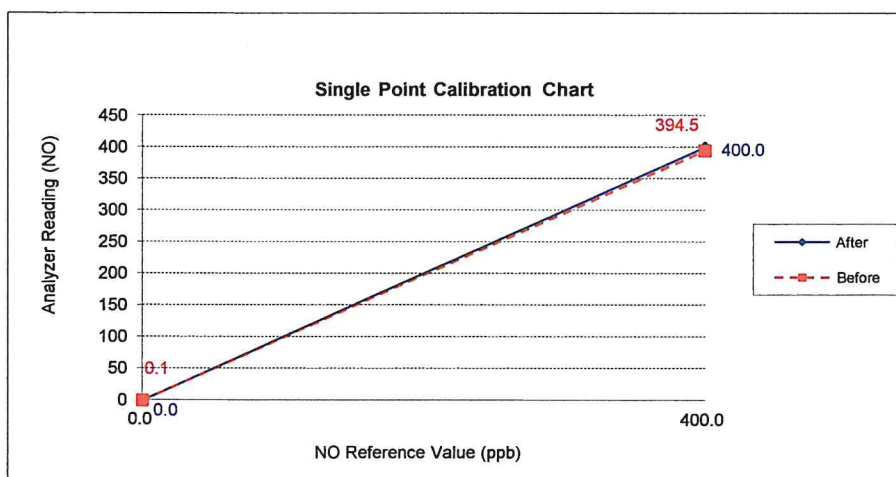
Humidity: 51 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	394.5	400.0	-1.4
NO _x	0.1	0.0	0.1	400.0	400.0	0.0

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NO _x	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By : Mr. Pasagorn Samol



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

Analyzer Performance Test

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: 42C	Manufacturer Thermo Environmental S/N: 42CLS-76495-380
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Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1924	NO Conc 45.2 PPM SO ₂ Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022

Environment: Temperature 25.5 °C

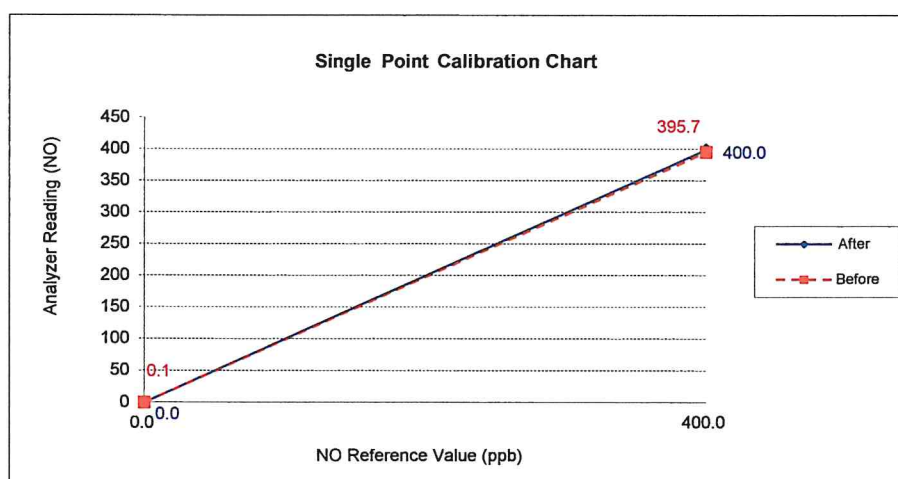
Humidity: 51 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	395.7	400.0	-1.1
NO _x	0.1	0.0	0.1	400.0	400.0	0.0

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NO _x	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By : Mr. Pasagorn Samol