



Certificate of Calibration

Method 5 Pre-Test Calibration - Liters (L)

UUT Meter Console Information

Model #: XC-572-V
Serial #: A2001003
DGM Model #: SK25EX
DGM Serial #: 00005796

Calibration Conditions

Bar. Pressure (mm Hg): 758.3
Ambient Temperature (°C): 24.4
Relative Humidity (%): 40
Altitude (m): 1.83
Bar. Pressure Corr. (mm Hg): 758.2

Factors/Conversions

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

Reference Equipment

Calibration Meter Model: DGM-200H
Cal. Date: 03-Jun-22
Serial No.: 0000026
Gamma: 1.0000

UUT Meter (DGM)

Run Time (seconds)	Orifice, ΔH (mm H ₂ O)	Volume			Meter Temperature (°C)		Meter Pressure (°H ₂ O)	Reference Meter (WTM)		
		Initial (L)	Final (L)	Total (L)	Initial	Final		Initial	Final	Outlet Temperature (°C)
Θ	P _{m(g)}	V _m	V _{mf}	V _m	t _{mf}	t _{mf}	P _w	V _{mf}	V _w	t _{wf}
840.00	13.00	558671.6	558826.6	155.0	24.0	25.0	0.3	0.00	161.61	24.0
630.00	25.00	558826.6	558990.4	163.8	25.0	26.0	0.5	0.00	167.48	24.0
450.00	50.00	558990.4	559157.0	166.6	26.0	26.0	0.6	0.00	169.53	24.0
390.00	80.00	559157.0	559339.6	182.6	27.0	27.0	2.0	0.00	185.73	24.0
300.00	120.00	559339.6	559511.4	171.8	27.0	28.0	2.4	0.00	177.09	24.0

Standardized Data

Reference Meter (L)		UUT Meter (L)		Correction Factor		ΔH @ (mm H ₂ O)	
Vol	Std. Flow	Std. Vol.	Std. Flow	Value	Variance	ΔH @	Variance
V _{w(Std)}	Q _{w(Std)}	V _{m(Std)}	V _{w(Std)}	Y	ΔY	ΔH @	ΔΔH @
59.16	11.37	152.48	11.4	1.0438	0.0133	44.7	0.091
55.03	15.72	160.78	15.7	1.0264	-0.0042	44.9	0.314
57.09	22.28	163.65	22.3	1.0210	-0.0096	44.8	0.164
53.69	28.26	179.29	28.3	1.0245	-0.0060	44.8	0.199
55.32	35.06	169.05	35.1	1.0370	0.0065	43.8	-0.768
				1.0306	= Y Avg.	44.6	= ΔH @ Avg.

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ± 0.02 .
Note: For ΔH_g, orifice pressure differential that equates to 0.0212 m³/min at standard temperature and pressure, acceptable tolerance of individual values from the average is ± 0.2 inches (5.1 mm) H₂O.

Pass/Fail Judgment : **Pass**

Calibrate By: Tatungyan P

Approved By: K

Date: 28 Feb 23

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



Neediss Supply Management Co., Ltd

Nomenclature

P_b - Barometric Pressure
 DGM - Dry Gas Meter
 K_1 - Constant based on standard temp and press
 Θ - Run time, in minutes
 P_m - ΔH (Meter Pressure, gauge)
 V_m - Volume collected by test meter, corrected for STP
 $Q_{m(std)}$ - Calculated flow rate of test meter
 K' - Critical orifice coefficient
 P_w - Measured pressure of reference meter
 T_w - Temperature measured in reference meter

Equations

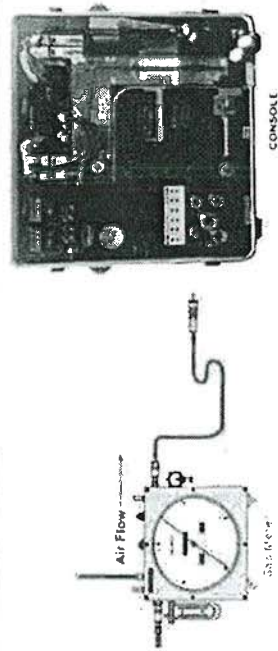
$$V_{m(std)} = V' * K_1 \frac{V_m * (P_{bar} + \frac{P_{m(std)}}{13.6})}{T_w}$$

$$K_1 V_m (P_{bar} + \frac{\Delta H}{13.6}) = \frac{T_w}{T_m}$$

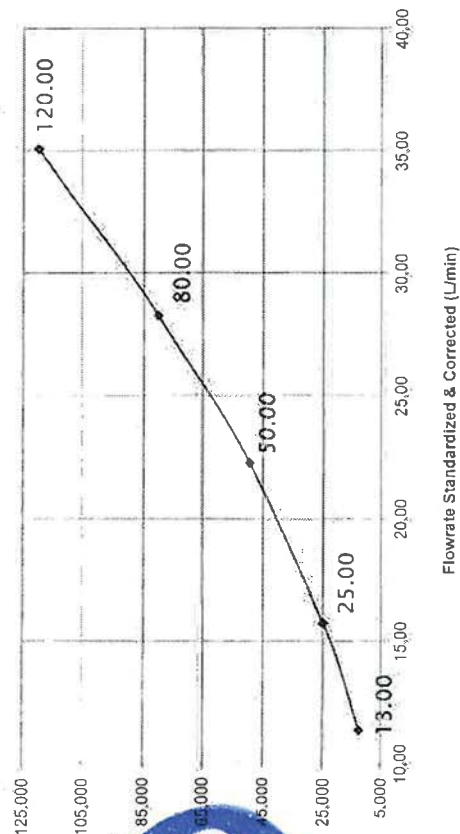
$$K_1 = \frac{T_{std}}{P_{std}} \frac{V_{m(std)}}{V' - V_{m(std)}} \quad Q_{m(std)} = \frac{V_{m(std)}}{\Theta}$$

$$\Delta P_{critical} \Delta H_w = \frac{P_{m(std)} * 0.0011606 * (P_{bar} + \frac{P_{m(std)}}{13.6})}{T_m} * \left(\frac{T_w * \Theta}{V' * P_{bar}} \right)^2$$

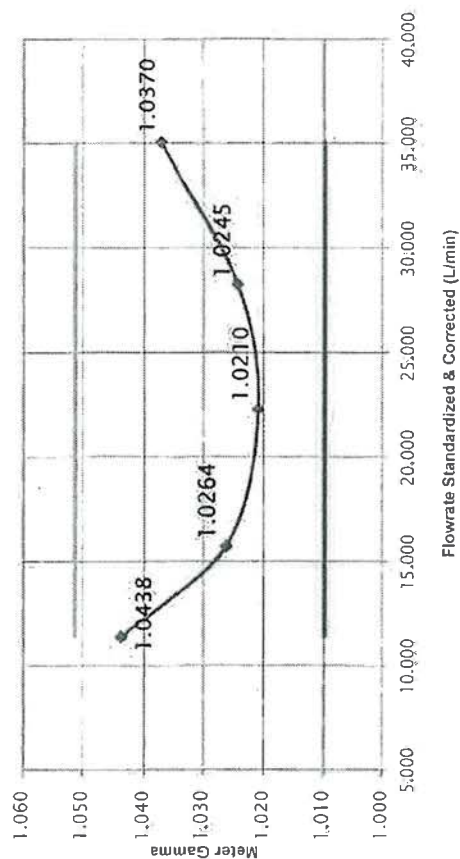
Calibration Train



Meter Pressure vs. Flowrate



Meter Gamma vs. Flowrate





Certificate of Calibration

Method 5 Console Sensor Calibration - Metric Units

Console Information

Model #: XC-572-V
Serial #: A2001003
Units: Metric

Calibration Conditions

Pbar (mm. Hg): 758.3
Humidity (%): 40
Tamb (°C): 24.4
Elevation (m): 1.8
Corr. Pbar (mm. Hg): 758.2

Reference Devices

TC Calibrator Model: CC-VTR-SH
Reference #: 091109269
Barometer Model: 736930
Reference #: EBARODIALSPE01
Pressure Model: 718 30G
Reference #: 9543013

Temperature Display Calibration Data

Reference Point ¹	Reference Temp.	Test Thermocouple Calibrations						Reference Point Status ²
		Aux	Stack	Probe	Oven	Filter	Exit	
#	°C	°C	°C	°C	°C	°C	°C	Pass/Fail
1	-18	-17	-17	-17	-17	-17	-17	PASS
2	38	38	37	38	38	37	37	PASS
3	93	93	93	94	93	93	94	PASS
4	149	150	150	149	149	149	149	PASS
5	260	260	259	259	259	259	259	PASS
6	371	370	371	372	370	370	370	PASS
7	482	481	481	483	481	481	481	PASS
8	593	592	592	594	592	592	592	PASS
9	816	815	816	816	817	816	816	PASS
10	1038	1038	1039	1039	1039	1039	1039	PASS
PASS								Overall Audit Status

NIST Reference Thermocouple ID:

12702001

Two Reference Thermocouples				
Ref Point	Theoretical Temp.	DGM Thermocouple Sensor Reading	ΔT_{abs}^4	
#	°C	°C	°C	
Ice Water	1	0.1	0	0.04%
Ambient ³	2	24.4	24	0.08%
Maximum ²			0.08%	
Status			PASS	

Internal temperature thermocouple is not audited to EPA standards, and should not be used as an official reference for ambient temperature.

Calibrate By:

Dutton P.

Approved By:

JK

Date: 28 Feb 23

Notes

¹ Suggested, minimum reference points are 10 (0, 100, 200, 300, 500, 700, 900, 1100, 1500, 1900 °F), can test for more.

² For valid test results, the maximum difference between temperature and reference readings should be less than ± 5.4 °F (± 3 °C), for all thermocouples except for the stack thermocouple which should be less than $\pm 1.5\%$ absolute temperature from the reference reading and the exit thermocouple which should be less than ± 2 °F (± 1 °C) from the reference reading (EPA Method 2, Section 6.3 and EPA Method 5, Sections 5.1.1 7-6, 1.1.8)

³ Do not change this cell value, it is instead based on input from Cell H8 at the top of this sheet under "Calibration Conditions"

⁴ Absolute temperature difference and other formulas are calculated based on unit input from cell C8 at the top of this sheet under "Meter Console Information"

⁵ For valid test results, the maximum difference between console and reference barometric pressure readings should be less than ± 0.1 in. Hg (± 2.5 mm Hg). (EPA Method 5, Section 6.1.2)

⁶ For valid test results, the maximum difference between console and reference vacuum readings should be less than ± 0.5 in. Hg (± 12.5 mm Hg)

⁶ For valid test results, the maximum difference between console and reference vacuum readings should be less than ± 0.5 in. Hg (± 12.5 mm Hg)



Calibration Supply Instrument

neediss Console Sensor Calibration Data Sheet

Console Information

Model #: XC-572-V
Serial #: A2001003
Units: Metric
Type: "Englis
h" or "Metric"

Calibration Conditions

Pbar (mm. Hg): 758.3
Humidity (%): 40.0
Tamb (°C): 24.4
Corr. Pbar (mm. Hg): 758.2

Reference Devices

TC Simulator Model: CC-VTR-SH
Reference #: 091109269
Barometer Model: 736930
Reference #: EBARODIALSPE01
Digital Pressure Calibrator Model: 718 30G
Reference #: 3891001

Pressure Gauge / Manometer Calibration Data

Console Vacuum Calibration			
Reference Point	Reference Vacuum	Console Vacuum	Reference Point Status ⁴
#	in. Hg	in. Hg	Pass/Fail
1	-5.0	-4.5	PASS
2	-15.0	-14.5	PASS
3	-20.0	-19.5	PASS

Reference Point ¹	ΔH Manometer Calibration			Reference Point Status ²
	Reference	Positive (+) Pitot	Negative (-) Pitot	
#	mm H2O	mm H2O	mm H2O	Pass/Fail
1	-200.000	0.0	-200.0	PASS
2	-150.000	0.0	-150.0	PASS
3	-100.000	0.0	-100.0	PASS
4	-80.000	0.0	-80.0	PASS
5	-50.000	0.0	-50.0	PASS
6	0.000	0.0	0.0	PASS
7	50.000	50.0	0.0	PASS
8	80.000	80.0	0.0	PASS
9	100.000	100.0	0.0	PASS
10	150.000	150.0	0.0	PASS
11	200.000	200.0	0.0	PASS
ΔH Overall Audit Status				PASS

Reference Point ¹	ΔP Manometer Calibration			Reference Point Status ²
	Reference	Positive (+) Pitot	Negative (-) Pitot	
#	mm H2O	mm H2O	mm H2O	Pass/Fail
1	-200.000	0.0	-200.0	PASS
2	-150.000	0.0	-150.0	PASS
3	-100.000	0.0	-100.0	PASS
4	-80.000	0.0	-80.0	PASS
5	-50.000	0.0	-50.0	PASS
6	0.000	0.0	0.0	PASS
7	50.000	50.0	0.0	PASS
8	80.000	80.0	0.0	PASS
9	100.000	100.0	0.0	PASS
10	150.000	150.0	0.0	PASS
11	200.000	200.0	0.0	PASS
ΔP Overall Audit Status				PASS

Calibrate By: Pattasapan P. Approved By: [Signature] Date: 28 Feb 23

Notes

¹ Suggested, minimum reference points are 10 (0, 100, 200, 300, 500, 700, 900, 1100, 1500, 1900 °F), can test for more.

² For valid test results, the maximum difference between temperature and reference readings should be less than ±5.4 °F (±3 °C) for all thermocouples except for the stack thermocouple which should be less than ±1.5% absolute temperature from the reference reading and the exit thermocouple which should be less than ±2 °F (±1 °C) from the reference

³ Do not change this cell value, it is instead based on input from Cell H8 at the top of this sheet under "Calibration Conditions"

⁴ Absolute temperature difference and other formulas are calculated based on unit input from cell C8 at the top of this sheet under "Meter Console Information"

⁵ For valid test results, the maximum difference between console and reference barometric pressure readings should be less than ±0.1 in. Hg (±2.5 mm Hg) (EPA Method 5, Section 5.1.2)

⁶ For valid test results, the maximum difference between console and reference vacuum readings should be less

⁷ For valid test results, the maximum difference between console and reference vacuum readings should be less

I certify that the above Thermocouple Sensors were calibrated in accordance with US EPA



Neediss Supply Instrument Co.



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Console Sensor Audit QA Sheet

Meter Console Information (UUT)

Model #: XC-572-V
Serial #: A2001003
Units: Metric

Calibration Conditions

Pbar (mm. Hg): 758.3
Humidity (%): 40
Amb. Temp. (°C): 24.4
Altitude (m): 1.8
Corrected Pbar (mm. Hg): 758.2

Reference Devices

TC Simulator Model: CC-VTR-SH
Reference #: 91109269
Barometer Model: 369307
Reference #: EBARODIALSPE01
DP Calibrator Model: 718 30G
Reference #: 9543013

Audit Data

Reference Point	Reference Temp.	Thermocouple Probe Audit						Reference Point Status ¹
		Aux	Stack	Probe	Oven	Filter	Exit	
	°C	°C	°C	°C	°C	°C	°C	Pass/Fail
Room	24.4	24	25	24	24	25	25	PASS
Ice Water	0.1	0	0	0	0	1	1	PASS

Console Vacuum Audit

Reference Point	Reference Vacuum	Console Vacuum	Reference Point Status ²
#	in. Hg	in. Hg	Pass/Fail
1	17.0	16.5	PASS

Calibrate By:

Pattanasan P

Approved By:

M

Date:

28 Feb 23

Notes

¹For valid test results, the maximum difference between test and reference readings should be less than 5.4 °F (3 °C), for all thermocouples except for the stack thermocouple which should be less than 1.5% absolute temperature from the reference reading and the exit thermocouple which should be less than 2°F (1 °C) from the reference reading (EPA Method 2, Section 6.3 and EPA Method 5, Sections 6.1.1.7-6.1.1.8)

²For valid test results, the maximum difference between console and reference barometric pressure readings should be less than 0.1 in. Hg (2.5 mm Hg), (EPA Method 5, Section 6.1.2)

³For valid test results, the maximum difference between console and reference vacuum readings should be less than 0.5 in. Hg (12.5 mm Hg)

I certify that the above Thermocouple, Barometric, and Vacuum Sensors were calibrated and audited in accordance with US EPA Methods, CFR 40 Part 60.

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Neediss Supply Instrument Co., Ltd.

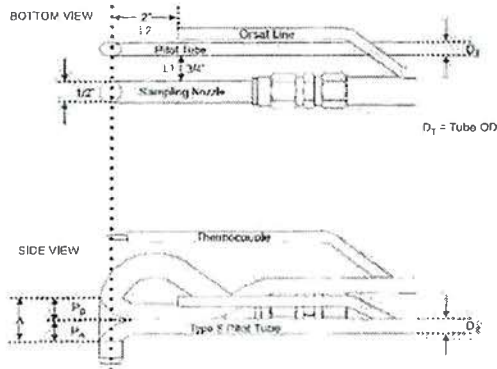
neediss Sampling Probe and Pitot Validation

Samplig System Equipment Information

Probe Sheat	Apex 1 in. , 5 ft.
Probe Number	1912458
Pitot tube Number	A8778
Pitot tube Type	S Type 3/8 Inc.
Validation method	Standard Probe 1 in. and 1/2 in. Sampling Nozzle

Validation Conditions and Equipment

Digital Calipers	CD-15APX
Reference No.	A22070181
Digital Inclinator	BASELINE
Reference No.	EEL 12-1057
Temperatute	24.4 °C±3
Barometric Pressure	758.3 mm Hg



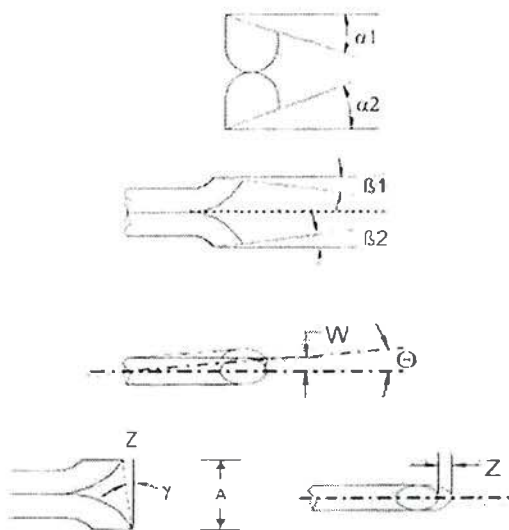
Sampling Probe Validation with Tune up

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

Measured	Standard Range
$L_1 = 1.90 \text{ cm.}$	(1.905 cm. or 3/4 in.)
$L_2 = 5.03 \text{ cm.}$	(5.08 cm. or 2.0 in.)
$D_T = 0.955 \text{ cm.}$	(3/8 in.)
$A = 2.08 \text{ cm.}$	($2.1 D_T \leq A \leq 3D_T$)
$A/2D_T = 1.091 \text{ cm.}$	($1.05 P_A / D_T \leq A \leq 1.5$)

Pitot Tube Validations and Engles measurement Result

☒ : Measure Result after Maintanance and Adjustable



P_B Size	Standard Range
$\alpha_1 = 3.00^\circ$	$\leq 10^\circ$
$\beta_1 = 1.10^\circ$	$\leq 5^\circ$
P_A Size	
$\alpha_2 = 2.20^\circ$	$\leq 10^\circ$
$\beta_2 = -2.00^\circ$	$\leq 5^\circ$

Engles measurement	Calculated Result	Standard Range
$W = -1.10^\circ$	-0.040 cm.	$W < 0.08 \text{ cm (1/32 in.)}$
$Z = 1.10^\circ$	0.040 cm.	$Z < 0.032 \text{ cm (1/8 in.)}$

Can be use 0.84 for $C_p(s)$ if the type of face-opening misafgnment show above with not affect the base line value of $C_p(s)$ Solong as standard range

Validation By:

Pattaporn P.

Approved By:

Vh

Date:

28 Feb 23

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Neediss Supply Instrument Co., Ltd.



Nozzle Validation

Samplig System Equipment Information

Console Model	XC-572-V
Console Number	A2001003
DGM Model	SK25EX
DGM Number	00005796

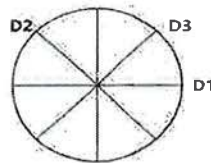
Validation Conditions

Digital Calipers	CD-15APX
Reference No	A22070181
Temperatute	24.8 °C±3
Barometric Pressure	758.2 mm Hg

Validation Data					Results	
Nozzle ID	Nozzle Diameter				Different	(D ₁ + D ₂ + D ₃) / 3
Sizes		D ₁	D ₂	D ₃	ΔD	Davg
	mm	mm	mm	mm	mm	mm
NS-5	3.96	3.97	3.97	3.97	0.000	3.970
NS-7	5.30	5.00	4.97	4.96	0.021	4.977
NS-9	7.13	7.10	7.10	7.11	0.006	7.103
NS-11	8.71	8.47	8.47	8.53	0.035	8.490
NS-13	10.31	10.31	10.29	10.30	0.010	10.300
NS-15	11.88	11.80	11.79	11.79	0.006	11.793
NS-17	13.48	13.48	13.49	13.49	0.006	13.487

Where :

- D₁, D₂, D₃ = There difference nozzle diameters , mm ; diameter must be within 0.025 mm
Δ D = Maximum difference between any two diameters, must be ≤ 0.100 mm
D avg = (D₁ + D₂ + D₃) / 3



Validation By:

Pattanasorn P.

Approved By:

[Signature]

Date:

28 Feb 23



Neediss Supply Instrument Co.,Ltd.



Certificate of Calibration

Method 5 Pre-Test Calibration - Liters (L)

UUT Meter Console Information

Model #: 800-STACKS-5
Serial #: 1837
DGM Model #: GB/T6968-2011
DGM Serial #: L1500033637

Calibration Conditions

Bar. Pressure (mm Hg): 759.8
Ambient Temperature (°C): 24.4
Relative Humidity (%): 47
Altitude (m): 1.83
Bar. Pressure Corr. (mm Hg): 759.7

Factors/Conversions

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

Reference Equipment

Calibration Meter Model: DGM-200H
Cal. Date: 03-Jun-22
Serial No.: 0000026
Gamma: 1.0000

UUT Meter (DGM)

Run Time (seconds)	Orifice ΔH (mm H ₂ O)	Volume		Meter Temperature (°C)		Meter Pressure (mm Hg)	Volume (L)		Outlet Temperature (°C)	
		Initial (L)	Final (L)	Initial	Final		Initial	Final	Initial	Final
Θ	P _{mig}	V _m	V _{mf}	t _{mf}	t _{mf}	P _w	V _m	V _{mf}	t _{mf}	t _{mf}
840.00	13.00	469033.5	469195.0	24.0	24.0	0.3	0.00	154.93	24.0	24.0
630.00	25.00	469195.0	469362.5	24.0	25.0	0.5	0.00	161.02	24.0	24.0
450.00	50.00	469362.5	469530.2	25.0	25.0	0.6	0.00	161.83	24.0	24.0
360.00	80.00	469530.2	469698.7	25.0	25.0	2.0	0.00	162.93	24.0	24.0
300.00	120.00	469698.7	469869.4	25.0	26.0	2.4	0.00	164.81	24.0	24.0

Reference Meter (WTM)

Volume (L)		Outlet Temperature (°C)	
Initial	Final	Initial	Final
V _m	V _{mf}	t _{mf}	t _{mf}
0.00	154.93	24.0	24.0
0.00	161.02	24.0	24.0
0.00	161.83	24.0	24.0
0.00	162.93	24.0	24.0
0.00	164.81	24.0	24.0

Standardized Data

Reference Meter (L)		UUT Meter (L)		Correction Factor		ΔH @ (mm H ₂ O)	
Std. Vol.	Std. Flow	Std. Vol.	Std. Flow	Value	Variance	ΔH @	Variance
V _{w(Std)}	Q _{w(Std)}	V _{m(Std)}	V _{w(Std)}	Y	ΔY	ΔH @	ΔH @
152.89	10.92	159.46	10.9	0.9588	-0.0048	48.6	-0.819
158.97	15.12	165.29	15.1	0.9618	-0.0018	48.7	-0.769
159.82	21.31	165.61	21.3	0.9650	0.0014	49.2	-0.241
161.45	26.91	166.88	26.9	0.9675	0.0039	49.9	0.410
163.47	32.69	169.43	32.7	0.9649	0.0013	50.9	1.419
				0.9636	± Y Avg.	49.4	± ΔH @ Avg.

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

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

Pass/Fail Judgment: **Pass**

Calibrate By: *D. Thompson*

Approved By: *K*

Date: 16 Mar 23

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



neediss Supply Instrument Co., Ltd.



Certificate of Calibration - Supplemental

Nomenclature

- P_b - Barometric Pressure
- DGM - Dry Gas Meter
- K_1 - Constant based on standard temp and press
- t - Run time, in minutes
- P_m - ΔH (Meter Pressure, gauge)
- V_m - Volume collected by test meter, corrected for STP
- $Q_{m(std)}$ - Calculated flow rate of test meter
- K' - Critical orifice coefficient
- P_w - Measured pressure of reference meter
- T_w - Temperature measured in reference meter

Equations

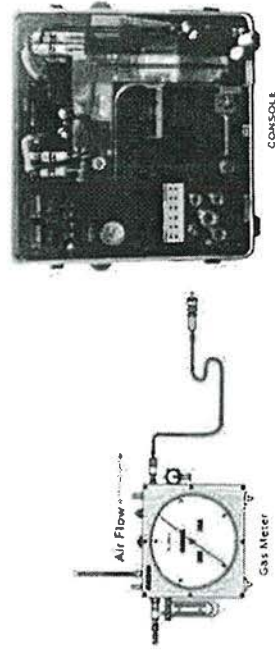
$$V_{w(std)} = Y * K_1 \frac{V_w * (P_{bar} + \frac{P_{m(std)}}{13.6})}{T_w}$$

$$V_{w(std)} = \frac{K_1 V_m (P_{bar} + \frac{\Delta H}{13.6})}{T_m}$$

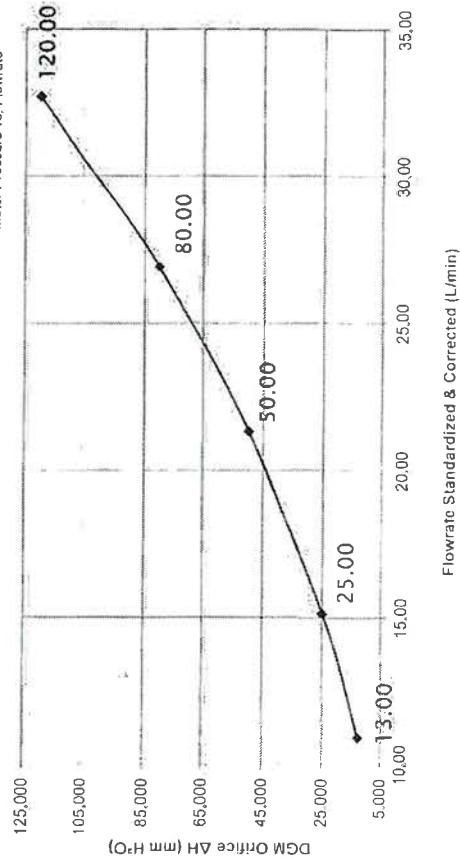
$$K_1 = \frac{T_{std}}{P_{std}} \quad Y = \frac{V_{cr(std)}}{V_{m(std)}} \quad Q_{w(std)} = \frac{V_{w(std)}}{t}$$

$$Metric \Delta H_N = \frac{P_{m(std)} * 0.0011339 * (P_{bar} + \frac{P_{m(std)}}{13.6}) * (T_w * t)}{T_m * (V_w * P_{bar})}$$

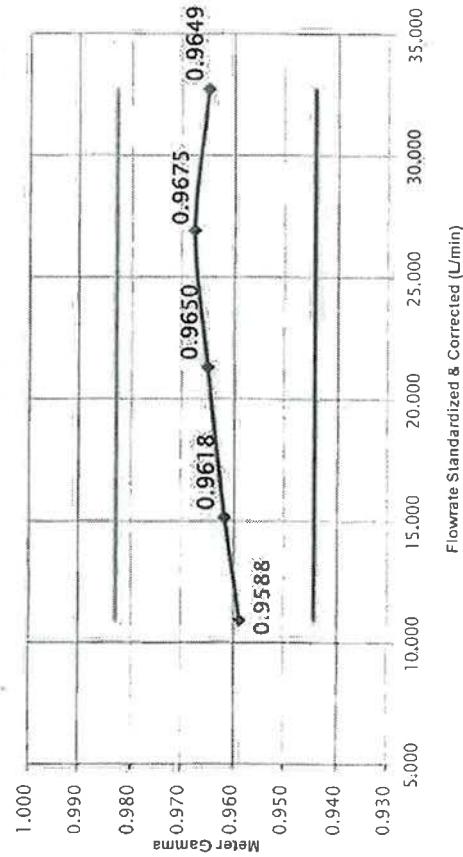
Calibration Train



Meter Pressure vs. Flowrate



Meter Gamma vs. Flowrate





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Certificate of Calibration

Method 5 Console Sensor Calibration - Metric Units

Console Information

Model #: 800-STACKS-5
Serial #: 1837
Units: Metric

Calibration Conditions

Pbar (mm. Hg): 759.8
Humidity (%): 47
Tamb (°C): 24.4
Elevation (m): 1.8
Corr. Pbar (mm. Hg): 759.7

Reference Devices

TC Calibrator Model: CC-VTR-SH
Reference #: 091109269
Barometer Model: 736930
Reference #: EBARODIALSPE01
Pressure Model: 718 30G
Reference #: 9543013

Temperature Display Calibration Data

Reference Point ¹	Reference Temp.	Test Thermocouple Calibrations					Reference Point Status ²
		Stack	Probe	Filter	Dryer	Aux	
#	°C	°C	°C	°C	°C	°C	Pass/Fail
1	-18	-17	-17	-17	-16	-17	PASS
2	38	37	38	39	39	39	PASS
3	93	93	94	94	95	94	PASS
4	149	149	150	151	150	150	PASS
5	260	259	260	260	260	260	PASS
6	371	371	372	373	372	372	PASS
7	482	482	483	484	483	483	PASS
8	593	593	594	595	594	594	PASS
9	816	815	816	817	816	817	PASS
10	1038	1036	1038	1038	1037	1039	PASS
							PASS

Overall Audit Status

NIST Reference Thermocouple ID:

12702001

NOT Reference Thermocouple ID: 12V2208				
Ref Point	Theoretical Temp.	DGM Thermocouple Sensor Reading	ΔT_{abs} ⁴	
#	°C	°C	°C	
Ice Water	1	0.3	1	0.26%
Ambient ³	2	24.4	25	0.12%
			Maximum ²	0.26%
			Status	PASS

Internal temperature thermocouple is not audited to EPA standards, and should not be used as an official reference for ambient temperature.

Calibrate By:

[Signature]

Approved By:

[Signature]

Date:

16 Mar 23

Notes

¹ Suggested, minimum reference points are 10 (0, 100, 200, 300, 500, 700, 900, 1100, 1500, 1900 °F), can test for more

² For valid test results, the maximum difference between temperature and reference readings should be less than ± 5.4 °F (± 3 °C), for all thermocouples except for the stack thermocouple which should be less than $\pm 1.5\%$ absolute temperature from the reference reading and the exit thermocouple which should be less than ± 2 °F (± 1 °C) from the reference reading (EPA Method 2, Section 6.3 and EPA Method 5, Sections 6.1, 1.7-6.1.1.8)

³ Do not change this cell value, it is instead based on input from Cell H8 at the top of this sheet under "Calibration Conditions"

⁴ Absolute temperature difference and other formulas are calculated based on unit input from cell CB at the top of this sheet under "Meter Console Information"

⁵ For valid test results, the maximum difference between console and reference barometric pressure readings should be less than ± 0.1 in. Hg (± 2.5 mm Hg), (EPA Method 5, Section 6.1.2)

⁶ For valid test results, the maximum difference between console and reference vacuum readings should be less than ± 0.5 in. Hg (± 12.5 mm Hg)

⁶ For valid test results, the maximum difference between console and reference vacuum readings should be less than ± 0.05 in. Hg (± 1.25 mm Hg), or 5% of full scale



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Console Sensor Calibration Data Sheet

Console Information

Model #: 800-STACKS-5
 Serial #: 1837
 Units: Metric
 Type: "English"

Calibration Conditions

Pbar (mm. Hg): 759.8
 Humidity (%): 47.0
 Tamb (°C): 24.4
 Corr. Pbar (mm. Hg): 759.7

Reference Devices

TC Simulator Model: CC-VTR-SH
 Reference #: 091109269
 Barometer Model: 736930
 Reference #: EBARODIALSPE01
 Digital Pressure Calibrator Model: 718.30G
 Reference #: 3891001

Pressure Gauge / Manometer Calibration Data

Console Vacuum Calibration			
Reference Point	Reference Vacuum	Console Vacuum	Reference Point Status ⁶
#	in. Hg	in. Hg	Pass/Fail
1	-5.0	-4.5	PASS
2	-15.0	-14.5	PASS
3	-20.0	-19.5	PASS

Reference Point ¹	ΔH _h Manometer Calibration			Reference Point Status ²
	Reference mm H ₂ O	Positive (+) Pitot mm H ₂ O	Negative (-) Pitot mm H ₂ O	
#				Pass/Fail
1	-200.000	0.0	-200.0	PASS
2	-150.000	0.0	-150.0	PASS
3	-100.000	0.0	-100.0	PASS
4	-80.000	0.0	-80.0	PASS
5	-50.000	0.0	-50.0	PASS
6	0.000	0.0	0.0	PASS
7	50.000	50.0	0.0	PASS
8	80.000	80.0	0.0	PASS
9	100.000	100.0	0.0	PASS
10	150.000	150.0	0.0	PASS
11	200.000	200.0	0.0	PASS
ΔH Overall Audit Status				PASS

Reference Point ¹	ΔP _h Manometer Calibration			Reference Point Status ²
	Reference mm H ₂ O	Positive (+) Pitot mm H ₂ O	Negative (-) Pitot mm H ₂ O	
#				Pass/Fail
1	-200.000	0.0	-200.0	PASS
2	-150.000	0.0	-150.0	PASS
3	-100.000	0.0	-100.0	PASS
4	-80.000	0.0	-80.0	PASS
5	-50.000	0.0	-50.0	PASS
6	0.000	0.0	0.0	PASS
7	50.000	50.0	0.0	PASS
8	80.000	80.0	0.0	PASS
9	100.000	100.0	0.0	PASS
10	150.000	150.0	0.0	PASS
11	200.000	200.0	0.0	PASS
ΔP Overall Audit Status				PASS

Calibrate By:

Approved By:

Date:

16 Mar 23

Notes

¹ Suggested, minimum reference points are 10 (0, 100, 200, 300, 500, 700, 900, 1100, 1500, 1900 °F), can test for more.

² For valid test results, the maximum difference between temperature and reference readings should be less than ±5.4 °F (±3 °C), for all thermocouples except for the stack thermocouple which should be less than ±1.5% absolute temperature from the reference reading and the exit thermocouple which should be less than ±2 °F (±1 °C) from the reference

³ Do not change this cell value, it is instead based on input from Cell H8 at the top of this sheet under "Calibration Conditions"

⁴ Absolute temperature difference and other formulas are calculated based on unit input from cell C8 at the top of this sheet under "Meter Console Information"

⁵ For valid test results, the maximum difference between console and reference barometric pressure readings should be less than ±0.1 in. Hg (±2.5 mm Hg), (EPA Method 5, Section 6.1.2)

⁶ For valid test results, the maximum difference between console and reference vacuum readings should be less than ±0.5 in. Hg (±12.5 mm Hg)

⁷ For valid test results, the maximum difference between console and reference vacuum readings should be less than ±0.05 in. H₂O (±1.25 mm H₂O), or 5% of full scale

I certify that the above Thermocouple Sensors were calibrated in accordance with US EPA Methods 2 and 5, CFR 40 Part 60,



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neediss Console Sensor Audit QA Sheet

Meter Console Information (UUT)

Model #: 800-STACKS-5
 Serial #: 1837
 Units: Metric

Calibration Conditions

Pbar (mm. Hg): 759.8
 Humidity (%): 47
 Amb. Temp. (°C): 24.4
 Altitude (m): 1.8
 Corrected Pbar (mm. Hg): 759.7

Reference Devices

TC Simulator Model: CC-VTR-SH
 Reference #: 91109269
 Barometer Model: 369307
 Reference #: EBARODIALSPE01
 DP Calibrator Model: 718.30G
 Reference #: 9543013

Audit Data

Reference Point	Reference Temp	Thermocouple Probe Audit					Reference Point Status ¹
		Stack	Probe	Filter	Dryer	Aux	
	°C	°C	°C	°C	°C	°C	Pass/Fail
Room	24.4	24	25	25	26	26	PASS
Ice Water	0.4	0	0	1	1	2	PASS

Console Vacuum Audit			
Reference Point	Reference Vacuum	Console Vacuum	Reference Point Status ²
#	in. Hg	in. Hg	Pass/Fail
1	17.0	16.5	PASS

Calibrate By: Dattaraj P.

Approved By: [Signature]

Date: 16 Mar 23

Notes

¹For valid test results, the maximum difference between test and reference readings should be less than 5.4 °F (3 °C), for all thermocouples except for the stack thermocouple which should be less than 1.5% absolute temperature from the reference reading and the exit thermocouple which should be less than 2°F (1 °C) from the reference reading (EPA Method 2, Section 6.3 and EPA Method 5 Sections 6.1, 1.7-6.1.1, 8)

²For valid test results, the maximum difference between console and reference barometric pressure readings should be less than 0.1 in. Hg (2.5 mm Hg), (EPA Method 5, Section 6.1.2)

³For valid test results, the maximum difference between console and reference vacuum readings should be less than 0.5 in. Hg (12.5 mm Hg)

I certify that the above Thermocouple, Barometric, and Vacuum Sensors were calibrated and audited in accordance with US EPA Methods, CFR 40 Part 60,

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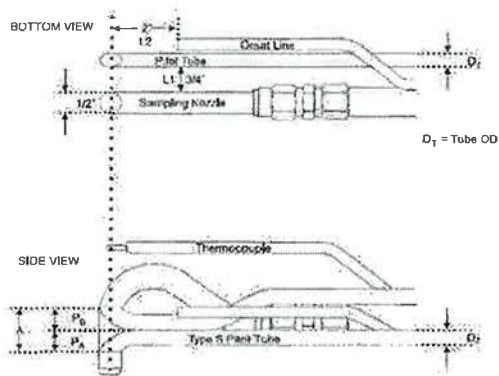
Sampling Probe and Pitot Validation

Samplig System Equipment Information

Probe Sheat	Apex 1 in. , 3 ft.
Probe Number	W2001490
Pitot tube Number	A8996
Pitot tube Type	S Type 3/8 Inc.
Validation method	Standard Probe 1 in. and 1/2 in. Sampling Nozzle

Valibration Conditions and Equipment

Digital Calipers	CD-15APX
Reference No.	A22070181
Digital Inclnometer	BASELINE
Reference No.	FEI 12-1057
Temperatute	25.6 °C±3
Barometric Pressure	758.2 mm Hg



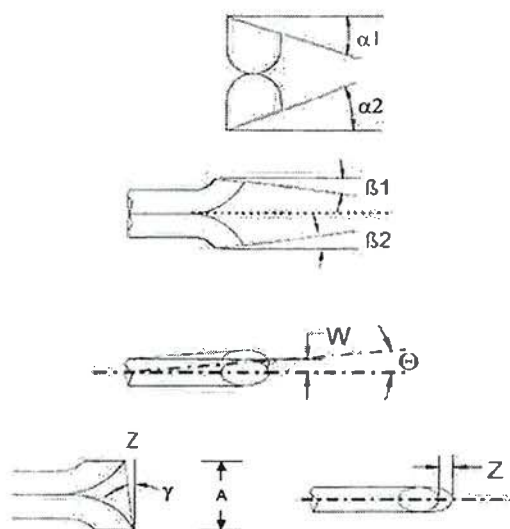
Sampling Probe Validation with Tune up

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

Measured	Standard Range
$L_1 = 1.80 \text{ cm.}$	(1.905 cm. or 3/4 in.)
$L_2 = 5.04 \text{ cm.}$	(5.08 cm. or 2.0 in.)
$D_T = 0.954 \text{ cm.}$	(3/8 in.)
$A = 2.01 \text{ cm.}$	($2.1 D_T \leq A \leq 3D_T$)
$A/2D_1 = 1.053 \text{ cm.}$	($1.05 P_A / D_T \leq A \leq 1.5$)

Pitot Tube Validations and Engles measurement Result

☒ : Measure Result after Maintenance and Adjustable



P_B Size	Standard Range
$\alpha_1 = -4.10^\circ$	$\leq 10^\circ$
$\beta_1 = 2.10^\circ$	$\leq 5^\circ$
P_A Size	
$\alpha_2 = -2.70^\circ$	$\leq 10^\circ$
$\beta_2 = 2.00^\circ$	$\leq 5^\circ$

Engles measurement	Calculated Result	Standard Range
$W = -3.00^\circ$	-0.106 cm.	$W < 0.08 \text{ cm (1/32 in.)}$
$Z = -1.70^\circ$	-0.060 cm.	$Z < 0.032 \text{ cm (1/8 in.)}$

Can be use 0.84 for $C_p(s)$ if the type of face-opening misafgnment show above with not affect the base line value of $C_p(s)$ Solong as standard range

Validation By:

Pattamaporn P.

Approved By:

H

Date:

16 Mar 23



Neediss Supply Instrument Co.,Ltd



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Nozzle Validation

Samplig System Equipment Information

Console Model 800-STACKS-5
Console Number 1837
DGM Model GB/T6968-2011
DGM Number L1500033637

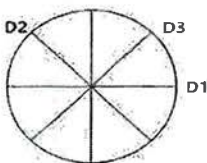
Validation Conditions

Digital Calipers CD-15APX
Reference No A22070181
Temperatute 24.4 °C±3
Barometric Pressure 759.7 mm.Hg

Validation Data					Results	
Nozzle ID	Nozzle Diameter				Different	$(D_1 + D_2 + D_3) / 3$
Sizes		D ₁	D ₂	D ₃	ΔD	Davg
	mm	mm	mm	mm	mm	mm
NS-4	3.17	3.17	3.17	3.16	0.006	3.167
NS-6	4.77	4.84	4.85	4.85	0.006	4.847
NS-8	6.35	6.42	6.45	6.48	0.030	6.450
NS-10	7.92	7.94	7.94	7.94	0.000	7.940
NS-12	9.52	9.53	9.52	9.52	0.006	9.523
NS-14	11.09	11.10	11.11	11.11	0.006	11.107
NS-16	12.70	12.44	12.45	12.44	0.006	12.443

Where :

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



Validation By:

P. P.

Approved By:

Vh.

Date:

16 Mar 23



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Tel. 02-802-3780-2 Fax. 02-802-0756 E-mail: info@neediss.com



Verification Test Report

Page:1/2

Instruments Information

Analyzer Type:	Flue Gas Analyser	Manufacturer:	MRU
Model:	Optima7	S/N:	320779

Calibration Gas information

Calibrator Unit	Standard Gas Mid Range	Standard Gas High Range
ZERO AIR Gen:	O2 Conc 2.2 %vol.	O2 Conc 10.22 %vol.
Ecotech8301	Cd/Ex: 343014/Jul 24,2025	Cd/Ex: 343018/Jan 10,2025
Dilutor Model:	CO Conc 99.94 ppm	CO Conc 594.5 ppm
EcotechGasCal1100	NO Conc 99.69 ppm	NO Conc 197.2 ppm
	NOX Conc 99.76 ppm	NOX Conc 197.2 ppm
	SO2 Conc 100.5 ppm	SO2 Conc 200.9 ppm
	Cd/Ex: ED5716/May 16,2030	Cd/Ex: ND7514/Jun 21,2030

Environment: Temperature 24.5 °C

Humidity: 37 %RH

SO2 calibration test

Before Adj					Reading (After Adj)
Set point	Std.gas (ppm)	Reading (ppm)	Difference	% error	Reading (ppm)
Low/Zero	0.0	0	0.0	0.0	0
Mid	100.5	100	-0.5	-0.5	100
Hight	200.9	201	0.1	0.0	201

NO calibration test

Before Adj					Reading (After Adj)
Set point	Std.gas (ppm)	Reading (ppm)	Difference	% error	Reading (ppm)
Low/Zero	0.0	0	0.0	0.0	0
Mid	99.69	99	-0.7	-0.7	99
Hight	197.2	201	3.8	1.9	201

NOX calibration test

Before Adj					Reading (After Adj)
Set point	Std.gas (ppm)	Reading (ppm)	Difference	% error	Reading (ppm)
Low/Zero	0.0	0	0.0	0.0	0
Mid	99.76	100.0	0.2	0.2	100
Hight	197.2	200.0	2.8	1.4	200

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Tel. 02-802-3760-2 Fax. 02-802-3788 E:info@neediss.com



Verification Test Report

Page:2/2

Instruments Information

Analyzer Type:	Flue Gas Analyser	Manufacturer:	MRU
Model:	Optima7	S/N:	320779

Calibration Gas information

Calibrator Unit	Standard Gas Mid Range			Standard Gas High Range		
ZERO AIR Gen:	O2 Conc	2.2	%vol.	O2 Conc	10.22	%vol.
Ecotech8301	Cd/Ex:	343014/Jul 24,2025		Cd/Ex:	343018/Jan 10,2025	
Dilutor Model:	CO Conc	99.94	ppm	CO Conc	594.5	ppm
EcotechGasCal1100	NO Conc	99.69	ppm	NO Conc	197.2	ppm
	NOX Conc	99.76	ppm	NOX Conc	197.2	ppm
	SO2 Conc	100.5	ppm	SO2 Conc	200.9	ppm
	Cd/Ex:	ED5716/May 16,2030		Cd/Ex:	ND7514/Jun 21,2030	

Environment: Temperature 25.7 °C

Humidity: 40 %RH

CO calibration test

Before Adj					Reading (After Adj)
Set point	Std.gas (ppm)	Reading (ppm)	Difference	% error	Reading (ppm)
Low/Zero	0.0	0.0	0.0	0.0	0
Mid	99.69	100.0	0.3	0.3	100
High	594.5	643	48.5	8.2	643

O2 calibration test

Before Adj					Reading (After Adj)
Set point	Std.gas (ppm)	Reading (ppm)	Difference	% error	Reading (ppm)
Low/Zero	0.0	0.2	0.2	0.2	0.2
Mid	2.20	2.2	0.0	0.0	2.2
High	10.22	10.1	-0.1	-1.2	10.1

Note

Technical Data Calibration results.:Calibration reading response discrepancy

O2 parameter	± 0.2 Vol-% at Range 0-21 Vol-%
CO2 parameter	± 0.3 Vol-% at Range 0-CO2 Max
CO parameter	± 5 % at Range 0-500 PPM
NO parameter	± 5 % at Range 0-1000 PPM
NO2 parameter	± 5 % at Range 0-1000 PPM
SO2 parameter	± 5 % at Range 0-2000 PPM

Calibrate By : Pattanasak P.

Approve By : [Signature]

Date: 3 Mar 23

Date: 3 Mar 23

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Verification Test Report

Page:1/2

Instruments Information

Analyzer Type:	Flue Gas Analyser	Manufacturer:	MRU
Model:	Optima7	S/N:	332604

Calibration Gas information

Calibrator Unit	Standard Gas Mid Range			Standard Gas High Range		
ZERO AIR Gen: Ecotech8301 Dilutor Model: EcotechGasCal1100	O2 Conc	2.2	%vol.	O2 Conc	10.22	%vol.
	Cd/Ex:	343014/Jul 24,2025		Cd/Ex:	343018/Jan 10,2025	
	CO Conc	99.94	ppm	CO Conc	594.5	ppm
	NO Conc	99.69	ppm	NO Conc	197.2	ppm
	NOX Conc	99.76	ppm	NOX Conc	197.2	ppm
	SO2 Conc	100.5	ppm	SO2 Conc	200.9	ppm
	Cd/Ex:	ED5716/May 16,2030		Cd/Ex:	ND7514/Jun 21,2030	

Environment: Temperature 31.6 °C

Humidity: 35 %RH

SO2 calibration test

Before Adj					Reading (After Adj)
Set point	Std.gas (ppm)	Reading (ppm)	Difference	% error	Reading (ppm)
Low/Zero	0.0	0	0.0	0.0	0
Mid	100.5	99	-1.5	-1.5	99
Hight	200.9	198	-2.9	-1.4	198

NO calibration test

Before Adj					Reading (After Adj)
Set point	Std.gas (ppm)	Reading (ppm)	Difference	% error	Reading (ppm)
Low/Zero	0.0	0	0.0	0.0	0
Mid	99.69	99	-0.7	-0.7	99
Hight	197.2	199	1.8	0.9	199

NOX calibration test

Before Adj					Reading (After Adj)
Set point	Std.gas (ppm)	Reading (ppm)	Difference	% error	Reading (ppm)
Low/Zero	0.0	0	0.0	0.0	0
Mid	99.76	99.0	-0.8	-0.8	99
Hight	197.2	199.0	1.8	0.9	199

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Tel: 02-802-1780-2 Fax: 02-802-0788 E-mail: info@neediss.com



Verification Test Report

Page:2/2

Instruments Information

Analyzer Type:	Flue Gas Analyser	Manufacturer:	MRU
Model:	Optima7	S/N:	332604

Calibration Gas information

Calibrator Unit	Standard Gas Mid Range			Standard Gas High Range		
ZERO AIR Gen:	O2 Conc	2.2	%vol.	O2 Conc	10.22	%vol.
Ecotech8301	Cd/Ex:	343014/Jul 24,2025		Cd/Ex:	343018/Jan 10,2025	
Dilutor Model:	CO Conc	99.94	ppm	CO Conc	594.5	ppm
EcotechGasCal1100	NO Conc	99.69	ppm	NO Conc	197.2	ppm
	NOX Conc	99.76	ppm	NOX Conc	197.2	ppm
	SO2 Conc	100.5	ppm	SO2 Conc	200.9	ppm
	Cd/Ex:	ED5716/May 16,2030		Cd/Ex:	ND7514/Jun 21,2030	

Environment: Temperature 31.6 °C Humidity: 35 %RH

CO calibration test					
Before Adj					Reading (After Adj)
Set point	Std.gas (ppm)	Reading (ppm)	Difference	% error	Reading (ppm)
Low/Zero	0.0	0.0	0.0	0.0	0
Mid	99.69	100.0	0.3	0.3	100
Hight	594.5	603	8.5	1.4	601

O2 calibration test					
Before Adj					Reading (After Adj)
Set point	Std.gas (ppm)	Reading (ppm)	Difference	% error	Reading (ppm)
Low/Zero	0.0	0.2	0.2	0.2	0.2
Mid	2.20	2.2	0.0	0.0	2.2
Hight	10.22	10.2	0.0	-0.2	10.2

Note

Technical Data Calibration results.:Calibration reading response discrepancy

O2 parameter	± 0.2 Vol-% at Range 0-21 Vol-%
CO2 parameter	± 0.3 Vol-% at Range 0-CO2 Max
CO parameter	± 5 % at Range 0-500 PPM
NO parameter	± 5 % at Range 0-1000 PPM
NO2 parameter	± 5 % at Range 0-1000 PPM
SO2 parameter	± 5 % at Range 0-2000 PPM

Calibrate By:

Approve By:

Date: 30 Mar 23

Date: 30 Mar 23



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Certificate of Calibration

Calibration Certification Information			
Cal. Date: February 9, 2024	Rootsmeter S/N: 438320	Ta: 295 °K	
Operator: Jim Tisch		Pa: 749.0 mm Hg	
Calibration Model #: TE-5025A	Calibrator S/N: 5411		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3950	3.2	2.00
2	3	4	1	0.9840	6.4	4.00
3	5	6	1	0.8790	7.9	5.00
4	7	8	1	0.8430	8.8	5.50
5	9	10	1	0.6940	12.7	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
0.9914	0.7106	1.4111	0.9957	0.7138	0.8875
0.9871	1.0032	1.9956	0.9915	1.0076	1.2551
0.9851	1.1207	2.2312	0.9895	1.1257	1.4033
0.9839	1.1672	2.3401	0.9883	1.1723	1.4718
0.9787	1.4103	2.8222	0.9830	1.4165	1.7750
QSTD	m=	2.02024	QA	m=	1.26504
	b=	-0.02667		b=	-0.01677
	r=	0.99993		r=	0.99993

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

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

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

CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120

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



NSC-TISI-TIS17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 67-410025-1

Page : 1 of 2

Submitted by : Envilab Co., Ltd.
540, 540/1 Soi Bangkhac 7, Bangkhac, Bangkok 10160

Equipment : Digital Thermo-Hygrometer

Manufacturer :	Jedto	Model :	HTC-1
Range Temperature :	N/A °C	Resolution :	0.1 °C
Range Humidity :	N/A %R.H.	Resolution :	1 %R.H.
Serial No. :	PONPE5852094	ID No. :	ELABTMHTC10003

Environment : Ambient Temperature : $(23 \pm 2) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$

Date of Received : 20 February 2024

Date of Calibration : 22 February 2024

Date of Issue : 22 February 2024

Calibrated by : Chortip Samchusri

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

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

Digital Indicator with Standard Probe Temp&Hum

ID No.	Cert. No.	Due Date	Traceability
400034 & 400035	SG-H-00020/67	05 Jul 2024	Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268

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. : 67-410025-1

Page : 2 of 2

UUC Condition As-Received : Good

Result of Calibration : Without Adjustment

Function : Temperature measurement

Reference Humidity @ 50 %R.H.

Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
24.98	25.0	0.0	0.46

Result of Calibration : Without Adjustment

Function : Humidity measurement

Reference Temperature @ 25 °C

Standard Humidity (%R.H.)	UUC Reading (%R.H.)	Correction (%R.H.)	Uncertainty (± %R.H)
50.03	50	0	2.2

Remark

UUC : Unit Under Calibration

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

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

- 000 -



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Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



Envilab & Evlorder Supply Instrument

TSP High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -TSP 01

☐ PM ☒ Onsite

Site: ลานกองภาคอ้อยด้านใต้ลมบริเวณในตาข่าย

UTM : 48P 194304 m E 1605114 m N

Sampler: ETSP#33

Recorder: ECRDS016339423

Date: 27 Feb 24

Technical: Kunanon P.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1005.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 753.8

Temperature (deg K): 305.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

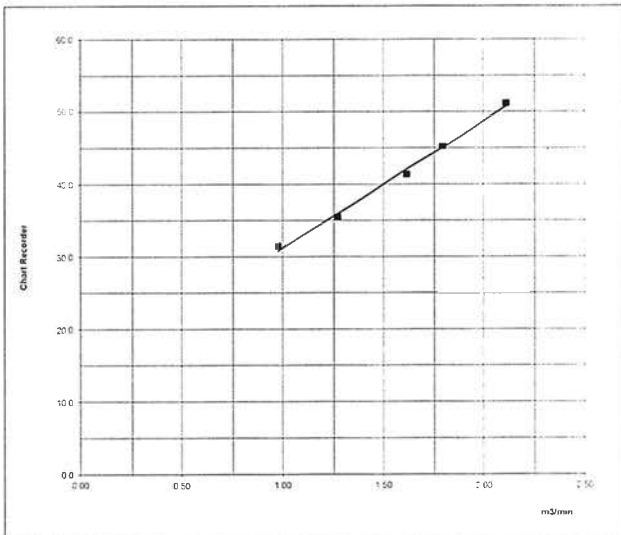
Qstd Slope: 1.63957

Qstd Intercept: -0.01202

Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION Slope = 17.5132 Intercept = 13.7639 Corr. coeff.= 0.9969 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 34 44
1	12.30	2.113	52.0	51.19	
2	8.80	1.788	46.0	45.28	
3	7.20	1.618	42.0	41.35	
4	4.40	1.267	36.0	35.44	
5	2.60	0.975	32.0	31.50	



Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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FE-MNT-29 Rev.00/01/08/63



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EnviLab Co., Ltd. 540/40/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



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TSP High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -TSP 02

☐ PM ☒ Onsite

Site: ลานกองกากอ้อยด้านเหนือลุมพินีในดงท้าย

UTM : 48P 194490 m E 1605226 m N

Sampler: ETSP#43

Recorder: ECRAN000031579

Date: 27 Feb 24

Technical: Kunanon P.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1005.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 753.8

Temperature (deg K): 305.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

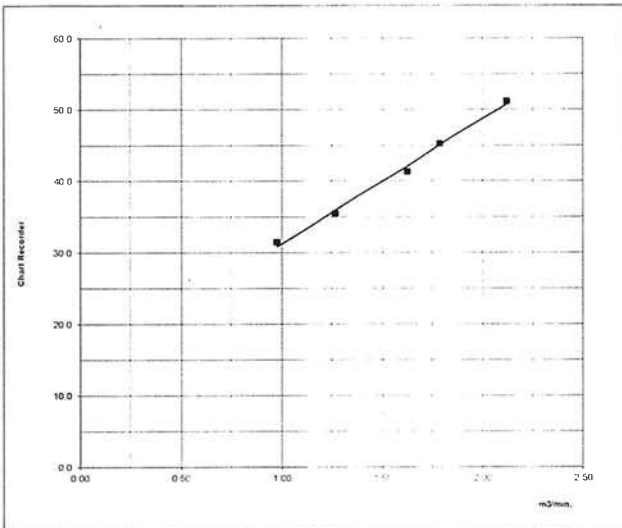
Qstd Slope: 1.63957

Qstd Intercept: -0.01202

Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	10.22	1.927	50.0	49.22	Slope = 18.0441
2	8.28	1.735	46.0	45.28	Intercept = 14.4192
3	6.89	1.583	44.0	43.31	Corr. coeff.= 0.9987
4	4.31	1.254	38.0	37.41	# of Observations: 5
5	2.53	0.962	32.0	31.50	Range of Chart at 1.1 - 1.7 m3/min. 35 45



Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10160
Tel : 02-802-3577-9 Fax: 02-802-3773 E-mail : info@evltesting.com



Envilab & Header Template 00000000000000000000

TSP High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -TSP 03

<input type="checkbox"/> PM	<input checked="" type="checkbox"/> Onsite
Site: <u>ลานกองกากอ้อยด้านใต้ลมบริเวณนอกค้ายาย</u>	
UTM : <u>48P 194306 m E 1605106 m N</u>	
Sampler: <u>ETSP#33</u>	
Recorder: <u>ECRDS016339423</u>	
Date: <u>27 Feb 24</u>	
Technical: <u>Kunanon P.</u>	
Approval: <u>Wisani R.</u>	

CONDITIONS

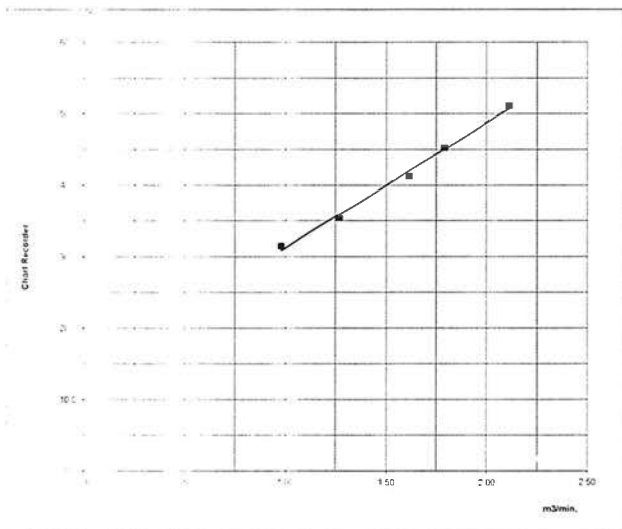
Barometric Press. (hPa): 1005.0	Corrected Pressure (mm Hg): 753.8
Temperature (deg C): 32.0	Temperature (deg K): 305.0
Average Press. (hPa): 1013.0	Corrected Avg.Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc	Qstd Slope: 1.63957
Model: TE-5025A	Qstd Intercept: -0.01202
Serial#: 5411	Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	12.30	2.113	52.0	51.19	Slope = 17.5132
2	8.80	1.788	46.0	45.28	Intercept = 13.7639
3	7.20	1.618	42.0	41.35	Corr. coeff.= 0.9969
4	4.40	1.267	36.0	35.44	
5	2.60	0.975	32.0	31.50	
					# of Observations: 5
					Range of Chart at 1.1 - 1.7 m3/min. 34 44



Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisani Ritthikamon)
27 February 2024

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EnviLab Co., Ltd. 540.540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-9577-8 Fax: 02-802-1773 E-mail : info@evltesting.com



EnviLab & EnviLab Supply Instructions

TSP High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -TSP 04

☐ PM ☒ Onsite

Site: ลานกองกากอ้อยด้านเหนือลม บริเวณนอกตาข่าย

UTM : 48P 194443 m E 1605300 m N

Sampler: ETSP#43

Recorder: ECRAN000031579

Date: 27 Feb 24

Technical: Kunanon P.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1005.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 753.8

Temperature (deg K): 305.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

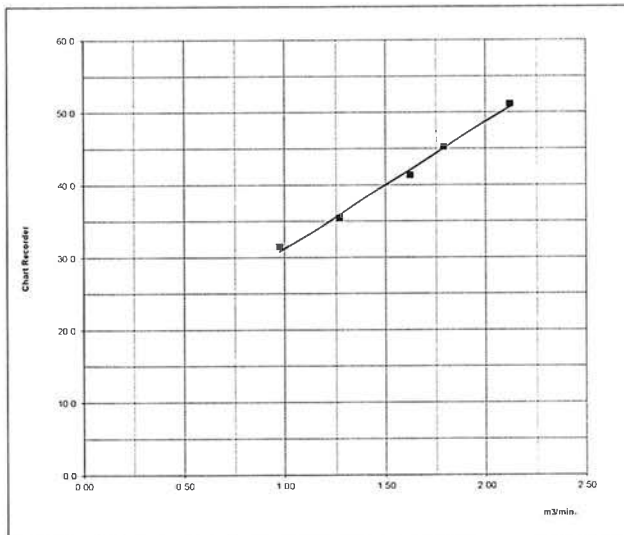
Qstd Slope: 1.63957

Qstd Intercept: -0.01202

Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION Slope = 18.0441 Intercept = 14.4192 Corr. coeff. = 0.9987 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 35 45
1	10.22	1.927	50.0	49.22	
2	8.28	1.735	46.0	45.28	
3	6.89	1.583	44.0	43.31	
4	4.31	1.254	38.0	37.41	
5	2.53	0.962	32.0	31.50	



Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10160
Tel : 02-802-2577-9 Fax: 02-802-2773 E-mail : info@evltesting.com



Envilab & Associates Supply Instrument

TSP High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -TSP 05

<input type="checkbox"/> PM	<input checked="" type="checkbox"/> Onsite
Site: 0	Date: 27 Feb 24
UTM: 0	Technical: Kunanon P.
Sampler: 0	Approval: Wisan R.
Recorder: 0	

CONDITIONS

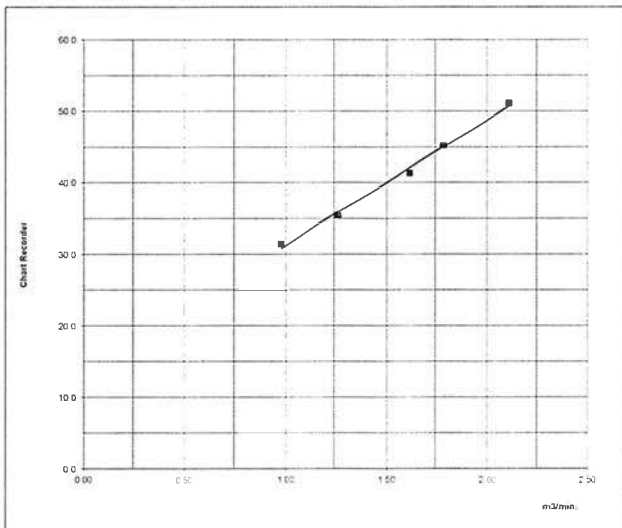
Barometric Press. (hPa): 0.0	Corrected Pressure (mm Hg): 0.0
Temperature (deg C): 0.0	Temperature (deg K): 273.0
Average Press. (hPa): 1013.0	Corrected Avg.Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc	Qstd Slope: 1.63957
Model: TE-5025A	Qstd Intercept: -0.01202
Serial#: 5411	Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	0.00	0.007	0.0	0.00	Slope = 0.0000
2	0.00	0.007	0.0	0.00	Intercept = 0.0000
3	0.00	0.007	0.0	0.00	Corr. coeff.= #DIV/0!
4	0.00	0.007	0.0	0.00	
5	0.00	0.007	0.0	0.00	# of Observations: 5
					Range of Chart at 1.1 - 1.7 m3/min. #DIV/0!



#DIV/0!

Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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Tel : 02-802-3577-8 Fax, 02-802-3773 E-mail : info@evltesting.com



1 - Only in-house quality management

TSP High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -TSP 06

<input type="checkbox"/> PM	<input checked="" type="checkbox"/> Onsite
Site: 0	Date: 27 Feb 24
UTM: 0	Technical: 0
Sampler: 0	Approval: Wisan R.
Recorder: 0	

CONDITIONS

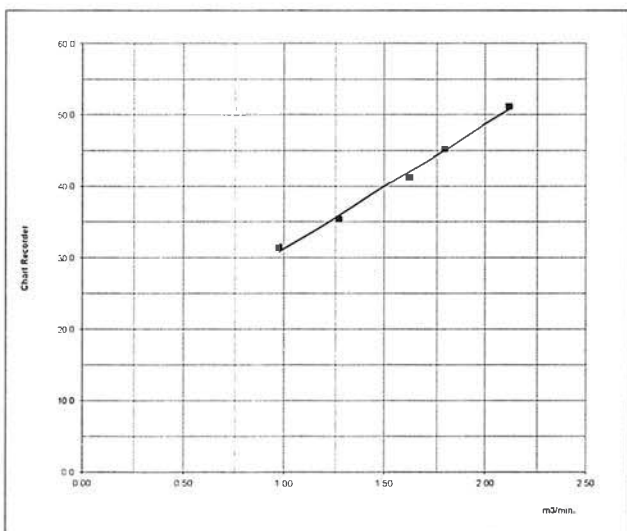
Barometric Press. (hPa): 0.0	Corrected Pressure (mm Hg): 0.0
Temperature (deg C): 0.0	Temperature (deg K): 273.0
Average Press. (hPa): 1013.0	Corrected Avg.Press. (mm Hg):
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc	Qstd Slope: 1.63957
Model: TE-5025A	Qstd Intercept: -0.01202
Serial#: 5411	Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	0.00	0.007	0.0	0.00	Slope = 0.0000
2	0.00	0.007	0.0	0.00	Intercept = 0.0000
3	0.00	0.007	0.0	0.00	Corr. coeff.= #DIV/0!
4	0.00	0.007	0.0	0.00	# of Observations: 5
5	0.00	0.007	0.0	0.00	Range of Chart #DIV/0!
					at 1.1 - 1.7 m3/min. #DIV/0!



#DIV/0!

Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



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TSP High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -TSP 01

☐ PM ☒ Onsite

Site: ชุมชนบ้านจระเข้หิน หมู่ที่ 1 (เขต อบต.จระเข้หิน)

UTM : 48P 196747 m E 1608301 m N

Sampler: ETSP#31

Recorder: ECRDS016339512

Date: 27 Feb 24

Technical: Kunanon P.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1005.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 753.8

Temperature (deg K): 305.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

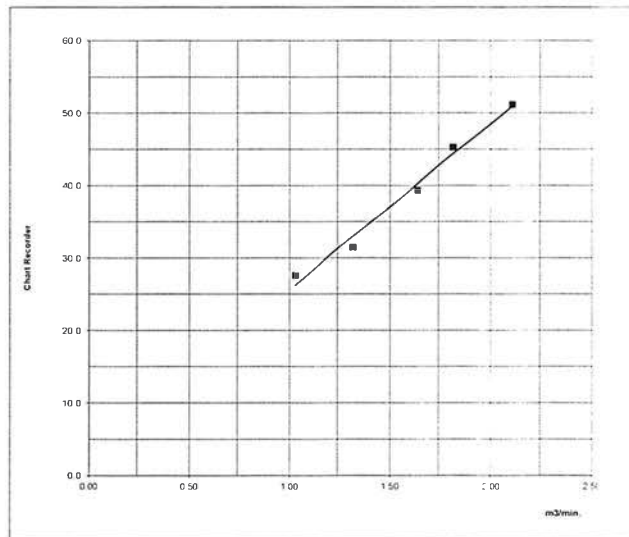
Qstd Slope: 1.63957

Qstd Intercept: -0.01202

Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	12.20	2.104	52.0	51.19	
2	9.10	1.819	46.0	45.28	Slope = 22.9048 Intercept = 2.7191 Corr. coeff.= 0.9925 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min. 29 42
3	7.40	1.641	40.0	39.38	
4	4.80	1.323	32.0	31.50	
5	2.90	1.030	28.0	27.56	



Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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TSP High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -TSP 02

☐ PM ☒ Onsite

Site: ชุมชนบ้านมุลบน หมู่ที่ 7 (เขต อบต.จระเข้หิน)

UTM : 48P 192991 m E 1605421 m N

Sampler: ETSP#32

Recorder: ECRAN000031072

Date: 27 Feb 24

Technical: Kunanon P.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1005.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 753.8

Temperature (deg K): 305.0

Corrected Avg.Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

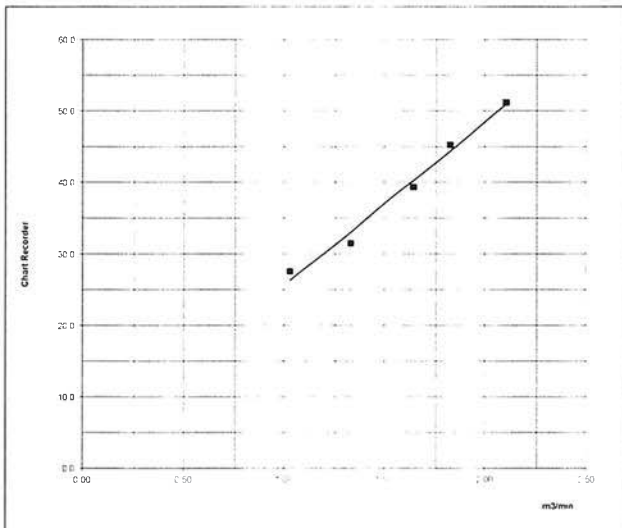
Qstd Slope: 1.63957

Qstd Intercept: -0.01202

Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	10.60	1.962	50.0	49.22	Slope = 19.5001
2	8.50	1.758	46.0	45.28	Intercept = 10.8617
3	6.90	1.584	42.0	41.35	Corr. coeff.= 0.9995
4	4.30	1.252	36.0	35.44	
5	2.50	0.957	30.0	29.53	
					# of Observations: 5
					Range of Chart at 1.1 - 1.7 m3/min. 33 44



Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



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TSP High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -TSP 03

<input type="checkbox"/> PM	<input checked="" type="checkbox"/> Onsite
Site: สำนักสงฆ์ทรัพย์มั่ง หรือบริเวณใกล้เคียง	
UTM : 48P 192160 m E 1603413 m N	
Sampler: ETSP#35	
Recorder: ECRANG15315225	
Date: 27 Feb 24	
Technical: Kunanon P.	
Approval: Wisan R.	

CONDITIONS

Barometric Press. (hPa): 1005.0

Corrected Pressure (mm Hg): 753.8

Temperature (deg C): 32.0

Temperature (deg K): 305.0

Average Press. (hPa): 1013.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg C): 30.0

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Qstd Slope: 1.63957

Model: TE-5025A

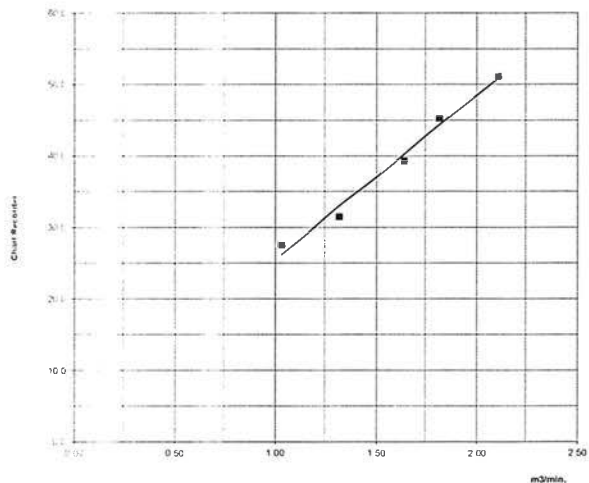
Qstd Intercept: -0.01202

Serial#: 5411

Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	11.42	2.036	52.0	51.19	Slope = 19.5260
2	10.18	1.923	50.0	49.22	Intercept = 11.9808
3	7.26	1.625	46.0	45.28	Corr. coeff.= 0.9931
4	4.72	1.312	38.0	37.41	
5	3.48	1.127	34.0	33.47	
					# of Observations: 5
					Range of Chart at 1.1 - 1.7 m3/min. 34 45



Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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TE-MNT-27 Rev.00 [01/08/63]

Environmental responsibility with accuracy measurement



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Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10160
Tel : 02-802-3577-9 Fax: 02-802-3773 E-mail : info@evltesting.com



Envilab & Envilab is a poly instrument

TSP High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -TSP 04

<input type="checkbox"/> PM	<input checked="" type="checkbox"/> Onsite
Site: <u>ชุมชนบ้านสระหลวง หมู่ที่ 13</u>	
UTM : <u>48P 194622 m E 1603907 m N</u>	
Sampler: <u>ETSP#36</u>	
Recorder: <u>ECRANG15315234</u>	
Date: <u>27 Feb 24</u>	
Technical: <u>Kunanon P.</u>	
Approval: <u>Wisan R.</u>	

CONDITIONS

Barometric Press. (hPa): 1005.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 753.8

Temperature (deg K): 305.0

Corrected Avg.Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

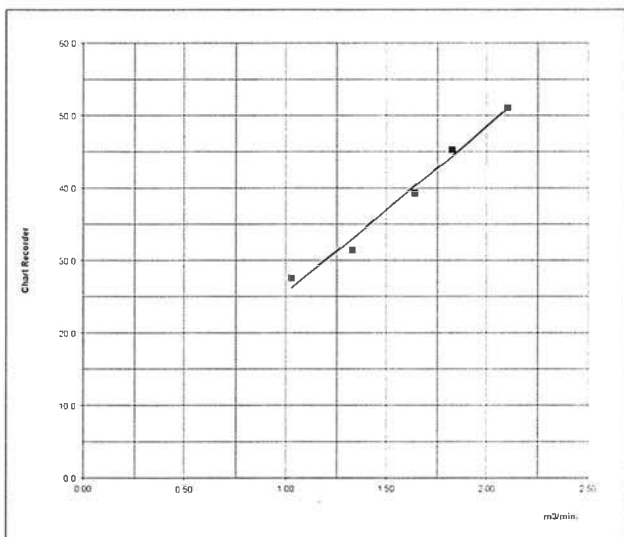
Qstd Slope: 1.63957

Qstd Intercept: -0.01202

Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	11.98	2.086	52.0	51.19	Slope = 15.4578
2	9.41	1.849	48.0	47.25	Intercept = 18.7335
3	8.20	1.727	46.0	45.28	Corr. coeff.= 0.9976
4	6.10	1.490	42.0	41.35	# of Observations: 5
5	4.70	1.309	40.0	39.38	Range of Chart at 1.1 - 1.7 m3/min. 37 45



Calibrated by :

(Signature)

(Kunanon Phila)
27 February 2024

Approved by :

(Signature)

(Wisan Ritthikamon)
27 February 2024

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FE-MNT-29 Rev 00.01/08/63



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Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkok Bangkok 10160
Tel : 02-802-3777-8 Fax: 02-802-3773 E-mail : info@evltesting.com



Envilab & Envilab Supply Test, Chem

TSP High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -TSP 05

<input type="checkbox"/> PM	<input checked="" type="checkbox"/> Onsite
Site: การประปาส่วนภูมิภาคหน่วยบริการระเข้หิน	
UTM : 48P 194915 m E 1605165 m N	
Sampler: ETSP#27	
Recorder: ECRANG15315236	
Date: 27 Feb 24	
Technical: Kunanon P.	
Approval: Wisan R.	

CONDITIONS

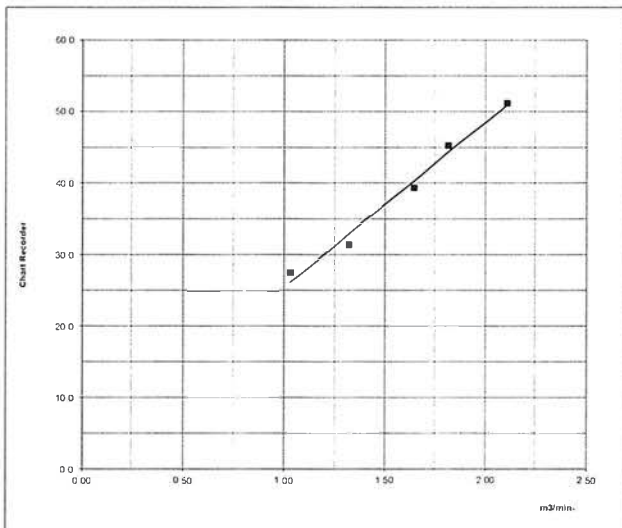
Barometric Press. (hPa): 1005.0	Corrected Pressure (mm Hg): 753.8
Temperature (deg C): 32.0	Temperature (deg K): 305.0
Average Press. (hPa): 1013.0	Corrected Avg.Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc	Qstd Slope: 1.63957
Model: TE-5025A	Qstd Intercept: -0.01202
Serial#: 5411	Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H ₂ O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	12.78	2.154	52.0	51.19	Slope = 14.8011
2	10.02	1.908	48.0	47.25	Intercept = 19.4357
3	8.20	1.727	46.0	45.28	Corr. coeff.= 0.9939
4	6.67	1.558	44.0	43.31	
5	4.30	1.252	38.0	37.41	
					# of Observations: 5
					Range of Chart at 1.1 - 1.7 m ³ /min. 37 45



Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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FE-MNT-27 Rev.00 (01/08/63)

FE-MNT-29 Rev.00:01/08/63



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Tel : 02-602-3577-8 Fax: 02-602-3773 E-mail : info@evltesting.com



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PM10 High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -PM 01

☐ PM

☒ Onsite

Site: ลานกองกากอ้อยด้านใต้ถนนบริเวณในตาข่าย

UTM : 48P 194304 m E 1605114 m N

Sampler: EPM10#43

Recorder: ECRANG15315239

Date: 27 Feb 24

Technical: Kunanon P.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1005.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 753.8

Temperature (deg K): 305.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

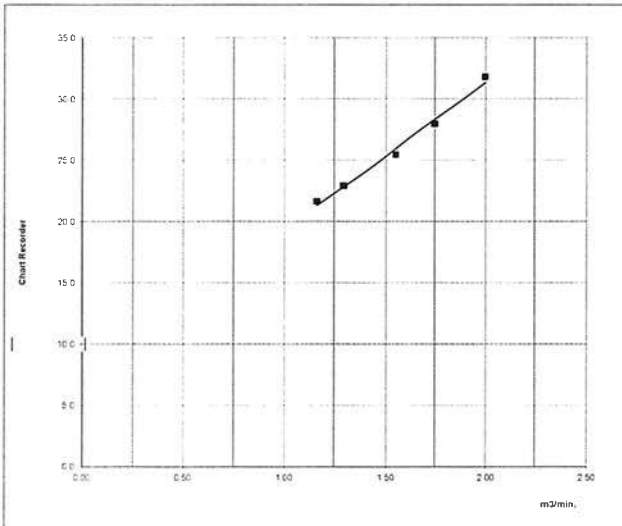
Qstd Slope: 1.02667

Qstd Intercept: -0.00753

Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	10.30	1.996	50.0	31.80	
2	7.90	1.749	44.0	27.99	Slope = 12.0834 Intercept = 7.2158 Corr. coeff. = 0.9947 SFR = 1.147 SSP = 33.12 # of Observations: 5 Range of Chart at SFR $\pm 10\%$
3	6.20	1.550	40.0	25.44	
4	4.30	1.292	36.0	22.90	
5	3.50	1.166	34.0	21.63	



Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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Envilab & Needles Supply Instrument

PM10 High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -PM 02

☐ PM ☒ Onsite

Site: ลานกองกากอ้อยด้านเหนือลอมบริเวณใบดาซ้าย

UTM : 48P 194490 m E 1605226 m N

Sampler: EPM10#24

Recorder: ECRDS016431068

Date: 27 Feb 24

Technical: Kunanon P.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1005.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 753.8

Temperature (deg K): 305.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

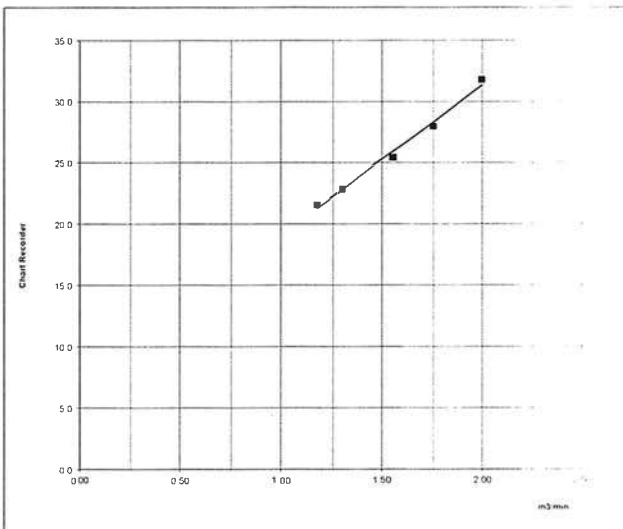
Qstd Slope: 1.02667

Qstd Intercept: -0.00753

Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	10.15	1.981	48.0	30.53	Slope = 11.7447
2	8.22	1.784	44.0	27.99	Intercept = 7.0394
3	6.76	1.618	40.0	25.44	Corr. coeff. = 0.9922
4	4.29	1.291	36.0	22.90	SFR = 1.147
5	3.47	1.161	32.0	20.35	SSP = 32.24
					# of Observations: 5
					Range of Chart at SFR $\pm 10\%$
					31
					34



Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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EnviLab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkhae Bangkok, 10160
Tel: 02-602-3577-8 Fax: 02-602-3773 E-mail: info@evltesting.com



EnviLab Co., Ltd. Sample Test Report

PM10 High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -PM 03

<input type="checkbox"/> PM <input checked="" type="checkbox"/> Onsite	Site: ลานกองกากอ้อยด้านใต้ลมนบริเวณนอกค้ายาย	Date: 27 Feb 24
	UTM : 48P 194306 m E 1605106 m N	Technical: Kunanon P.
	Sampler: EPM10#43	Approval: Wisan R.
	Recorder: ECRANG15315239	

CONDITIONS

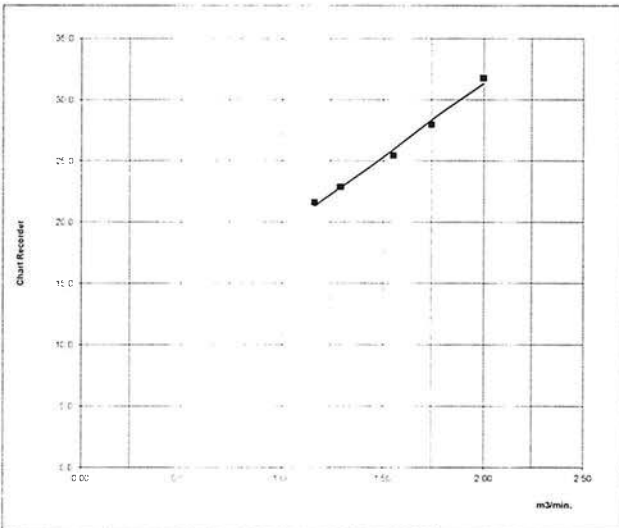
Barometric Press. (hPa): 1005.0	Corrected Pressure (mm Hg): 753.8
Temperature (deg C): 32.0	Temperature (deg K): 305.0
Average Press. (hPa): 1013.0	Corrected Avg. Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc	Qstd Slope: 1.02667
Model: TE-5025A	Qstd Intercept: -0.00753
Serial#: 5411	Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	10.30	1.996	50.0	31.80	Slope = 12.0834
2	7.90	1.749	44.0	27.99	Intercept = 7.2158
3	6.20	1.550	40.0	25.44	Corr. coeff.= 0.9947
4	4.30	1.292	36.0	22.90	SFR = 1.147
5	3.50	1.166	34.0	21.63	SSP = 33.12
					# of Observations: 5
					Range of Chart at SFR $\pm 10\%$
					32
					35



Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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PM10 Cal. Rev.07 / Iss.Date, Mar 17, 2020



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Tel : 02-602-9577-6 Fax: 02-602-9773 E-mail : info@evltesting.com



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PM10 High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -PM 04

☐ PM

☐ Onsite

Site: ลานกองกากอ้อยด้านเหนือลม บริเวณนอกคาชาย

UTM : 48P 194443 m E 1605300 m N

Sampler: EPM10#24

Recorder: ECRDS016431068

Date: 27 Feb 24

Technical: Kunanon P.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1005.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 753.8

Temperature (deg K): 305.0

Corrected Avg.Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

Qstd Slope: 1.02667

Qstd Intercept: -0.00753

Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)
1	10.15	1.981	48.0	30.53
2	8.22	1.784	44.0	27.99
3	6.76	1.618	40.0	25.44
4	4.29	1.291	36.0	22.90
5	3.47	1.161	32.0	20.35

LINEAR REGRESSION

Slope = 11.7447

Intercept = 7.0394

Corr. coeff. = 0.9922

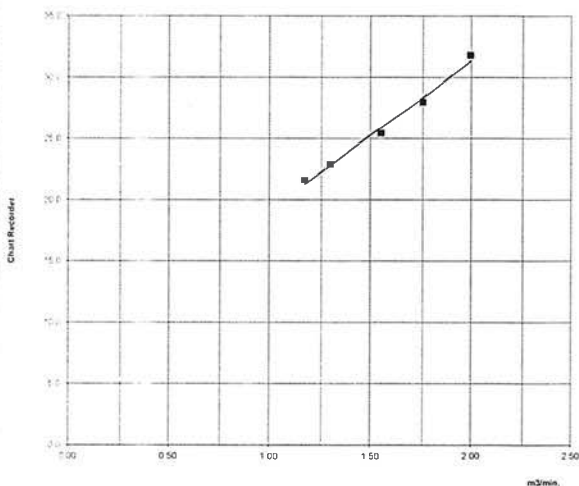
SFR = 1.147

SSP = 32.24

of Observations: 5

Range of Chart
at SFR $\pm 10\%$

31
34



Calibrated by :

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27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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EnviLab Co., Ltd. 540,540/108 Bangkok 7 Bangkok Bangkok Bangkok 10160
Tel : 02-602-3577-8 Fax: 02-602-3773 E-mail : info@evltesting.com



EnviLab & New Era Supply Instrument

PM10 High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -PM 01

<input type="checkbox"/> PM	<input checked="" type="checkbox"/> Onsite
Site: หมู่บ้านจระเข้หิน หมู่ที่ 1 (เขต อบต.จระเข้หิน)	
UTM : 48P 196747 m E 1608301 m N	
Sampler: EPM10#45	
Recorder: ECRANG15315224	
Date: 27 Feb 24	
Technical: Kunanon P.	
Approval: Wisan R.	

CONDITIONS

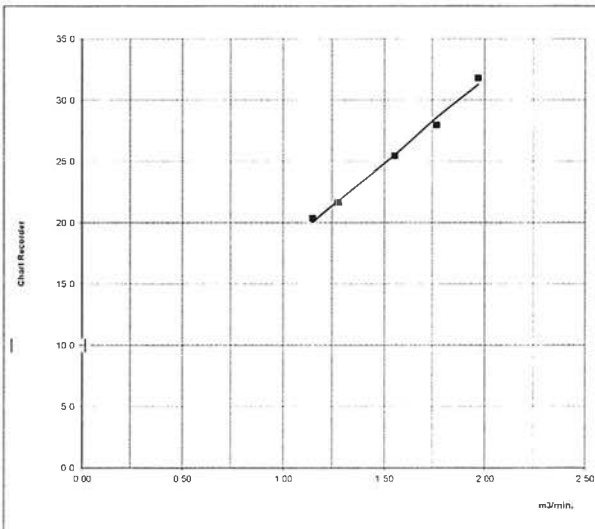
Barometric Press. (hPa): 1005.0	Corrected Pressure (mm Hg): 753.8
Temperature (deg C): 32.0	Temperature (deg K): 305.0
Average Press. (hPa): 1013.0	Corrected Avg. Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc	Qstd Slope: 1.02667
Model: TE-5025A	Qstd Intercept: -0.00753
Serial#: 5411	Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	10.00	1.967	50.0	31.80	Slope = 13.7733
2	8.10	1.771	44.0	27.99	Intercept = 4.1938
3	6.20	1.550	40.0	25.44	Corr. coeff.= 0.9956
4	4.20	1.277	34.0	21.63	SFR = 1.147
5	3.40	1.150	32.0	20.35	SSP = 31.42
					# of Observations: 5
					Range of Chart at SFR $\pm 10\%$
					30
					33



Calibrated by :

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27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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Envilab Co., Ltd. 540.540/1 Soi Bangkok 7 Bangkok Bangkok Bangkok 10160
Tel : 02-602-3577-8 Fax: 02-602-3773 E-mail : info@evltesting.com



Envilab R. Name: Sample Information

PM10 High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -PM 02

☐ PM ☒ Onsite

Site: ชุมชนบ้านมุลบน หมู่ที่ 7 (เขต อบต.จระเข้หิน)

UTM : 48P 192991 m E 1605421 m N

Sampler: EPM10#46

Recorder: ECRDS016431075

Date: 27 Feb 24

Technical: Kunanon P.

Approval: Wisarn R.

CONDITIONS

Barometric Press. (hPa): 1005.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 753.8

Temperature (deg K): 305.0

Corrected Avg.Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

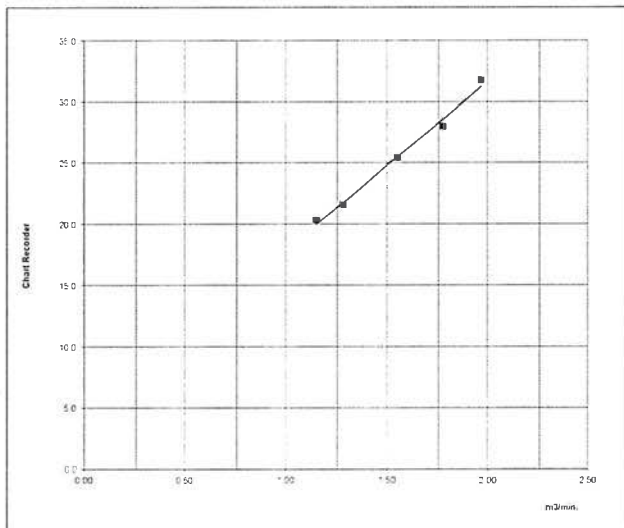
Qstd Slope: 1.02667

Qstd Intercept: -0.00753

Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	10.22	1.988	48.0	30.53	Slope = 13.6815
2	8.18	1.779	42.0	26.72	Intercept = 2.8619
3	6.36	1.570	38.0	24.17	Corr. coeff. = 0.9964
4	4.28	1.289	32.0	20.35	SFR = 1.147
5	3.47	1.161	30.0	19.08	SSP = 29.16
					# of Observations: 5
					Range of Chart at SFR $\pm 10\%$
					28
					31



Calibrated by :

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27 February 2024

Approved by :

(Wisarn Ritthikamon)
27 February 2024

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Tel : 02-602-2577-6 Fax : 02-602-3773 E-mail : info@evltesting.com



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PM10 High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -PM 03

☐ PM ☐ Onsite

Site: สำนักสงฆ์ทรัพย์มั่ง หรือบริเวณใกล้เคียง

UTM : 48P 192160 m E 1603413 m N

Sampler: EPM10#26

Recorder: ECRDS016449814

Date: 27 Feb 24

Technical: Kunanon P.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1005.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 753.8

Temperature (deg K): 305.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

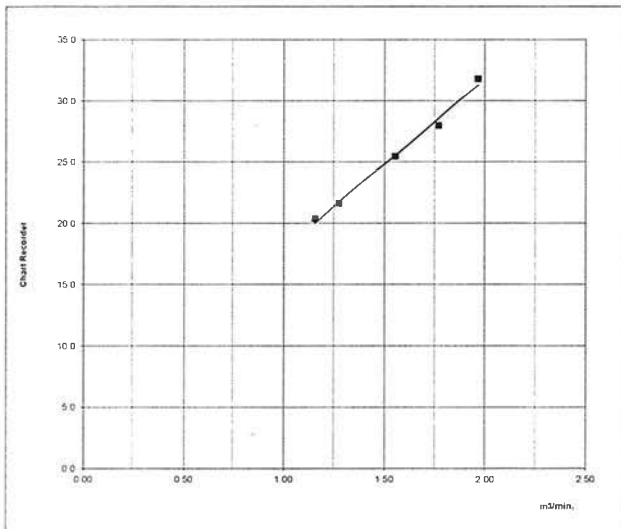
Qstd Slope: 1.02667

Qstd Intercept: -0.00753

Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	10.52	2.017	50.0	31.80	Slope = 13.6934
2	8.87	1.853	46.0	29.26	Intercept = 3.9711
3	6.22	1.553	40.0	25.44	Corr. coeff. = 0.9918
4	4.79	1.363	34.0	21.63	SFR = 1.147
5	3.39	1.148	32.0	20.35	SSP = 30.92
					# of Observations: 5
					Range of Chart 29
					at SFR $\pm 10\%$ 33



Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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Envilab Co., Ltd. 343 หมู่ 1 ซ. บางกะปิ 7 บางกะปิ กรุงเทพฯ 10160
Tel : 02-602-3577-6 Fax: 02-602-3773 E-mail : info@evltesting.com



Envilab & Navitas Supply Instrument

PM10 High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -PM 04

☐ PM ☒ Onsite

Site: ชุมชนบ้านสระหลวง หมู่ที่ 13

UTM : 48P 194622 m E 1603907 m N

Sampler: EPM10#33

Recorder: ECRANG15315233

Date: 27 Feb 24

Technical: Kunanon P.

Approval: Wisan R.

CONDITIONS

Barometric Press. (hPa): 1005.0

Temperature (deg C): 32.0

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

Corrected Pressure (mm Hg): 753.8

Temperature (deg K): 305.0

Corrected Avg. Press. (mm Hg): 759.8

Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 5411

Qstd Slope: 1.02667

Qstd Intercept: -0.00753

Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)
1	10.33	1.999	48.0	30.53
2	9.10	1.876	44.0	27.99
3	7.50	1.704	42.0	26.72
4	6.30	1.562	40.0	25.44
5	4.10	1.262	34.0	21.63

LINEAR REGRESSION

Slope = 11.3692

Intercept = 7.3534

Corr. coeff. = 0.9907

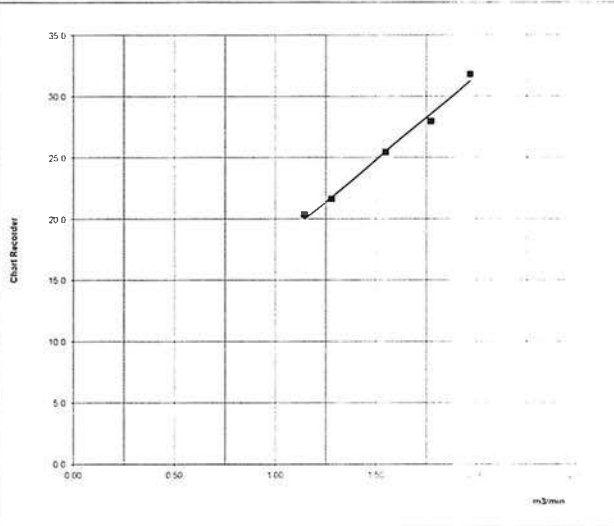
SFR = 1.147

SSP = 32.05

of Observations: 5

Range of Chart at SFR $\pm 10\%$

31
33



Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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www.evltesting.com

PM10 Cal. Rev 07 / Iss.Date: Mar 17, 2020

Environmental responsibility with accuracy measurement

FE-MNT-29 Rev.00:01/08/63



บริษัท เอ็นโวลแล็บ จำกัด 540,540/1 ถนนพหลโยธิน 7 แขวงบางพลัด เขตบางพลัด กรุงเทพมหานคร 10710
Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10710
Tel : 02-602-3577-8 Fax: 02-602-3773 E-mail : info@evltesting.com



Amulab 8 March 2024 00:00:00

PM10 High Volume Sampler Calibration

Verification Report No.

SO2400021-E002 -PM 05

PM	Onsite
Site: การประชาสัมพันธ์หน่วยงานบริการจะเข้หิน	
UTM: 48P 194915 m E 1605165 m N	
Sampler: EPM10#32	
Recorder: ECRDS019075270	
Date: 27 Feb 24	
Technical: Kunanon P.	
Approval: Wisan R.	

CONDITIONS

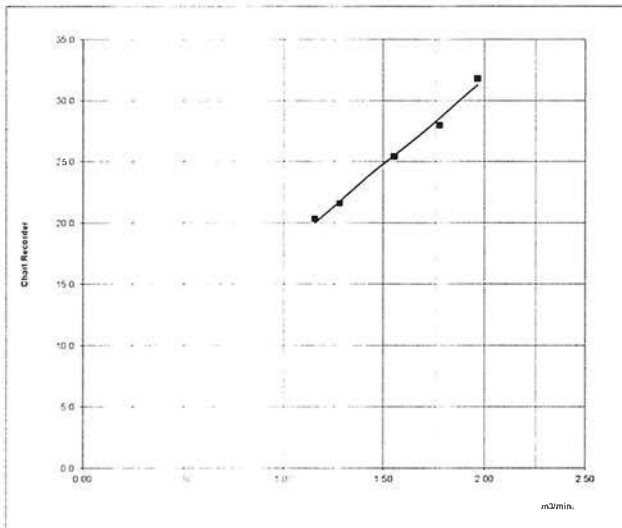
Barometric Press. (hPa): 1005.0	Corrected Pressure (mm Hg): 753.8
Temperature (deg C): 32.0	Temperature (deg K): 305.0
Average Press. (hPa): 1013.0	Corrected Avg. Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0	Average Temp. (deg K): 303.0

CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc	Qstd Slope: 1.02667
Model: TE-5025A	Qstd Intercept: -0.00753
Serial#: 5411	Date Certified: 9 Feb 2024

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	10.15	1.981	46.0	29.26	Slope = 12.6652
2	8.37	1.800	42.0	26.72	Intercept = 4.0211
3	6.30	1.562	38.0	24.17	Corr. coeff.= 0.9906
4	4.80	1.365	32.0	20.35	SFR = 1.147
5	3.38	1.146	30.0	19.08	SSP = 29.15
					# of Observations: 5
					Range of Chart at SFR $\pm 10\%$
					28 31



Calibrated by :

(Kunanon Phila)
27 February 2024

Approved by :

(Wisan Ritthikamon)
27 February 2024

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Environmental responsibility with accuracy measurement

PM10 Cal. Rev.07 / Iss Date: Mar 17 2020

FE-MNT-29 Rev.00-01/08/63



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บริษัท นีดิส ซัพพลาย อินสตรูเมนต์ จำกัด
Neediss Supply Instrument Co., Ltd.

536 ซอยบางพลี 7 แขวงบางพลี เขตบางพลี กรุงเทพมหานคร 10160 536 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok
Tel 02-802-3980-2 Fax 02-802-3988 E: info@neediss.com



Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6602016

Instrument :

PM-2.5 Sampler SINGLE

Validation Date:

1-Feb-23

Manufacturer :

Tisch Environmental

Model :

TE-Wilbur 2.5

Serial/ID No. :

EP2TIWILBU0481

Environment :

Humidity(%RH) : 49

Temperature (°C) : 23.4

Pressure (mmHg) : 745

Reference Standard:

Temperature Calibrator : DIGICON, model: CC-VTR-SH, Serial No.091109269

Flow Calibrator: Mesalabs Defender, model : 520-H , Serial No.164578

Leak Test : Pass

Diagnostic Check:

PM-10 Inlet	PM-2.5 Size Selective	Filter Cassette	Fan	Valve	Pump %
Pass	Pass	Pass	Pass	Pass	Pass

Result of Instrument Validation :

Calibrator Simulator					Temperature Measurement	
Temperature Audit and Adjust with Calibrator (°C)					Instrument	Reference
Set point	-10.0	0.0	20.0	45.0	Reading(Avg.)	TC Reading
ambient	-10.0	0.0	20.0	45.0	25.0	24.9
Filter	-10.0	0.0	20.0	45.0	29.6	29.5

Flow Control :

Calibration mode : AMB Flow Device

Flow set: 16.67 LPM

Avg. Pressure at Ref. : 746 mmHg.

Flow Measure (Avg.)	Flow Calibrator(Avg.10)	Flow Difference
16.67 LPM	16.69 LPM	-0.02 LPM



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Engineer :

Sirirat Poonlak

Neediss Supply Instrument Co., Ltd.

[Signature]

Sirirat Poonlak

Sarawut Keawsrinual

Issu Date:

1-Feb-23

Date:

1-Feb-23

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536 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพมหานคร 10160 536 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok
Tel. 02-802-3980-2 Fax. 02-802-3983 E-mail: info@neediss.com



Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6602005

Instrument :

PM-2.5 Sampler SINGLE

Validation Date:

1-Feb-23

Manufacturer :

Tisch Environmental

Model :

TE-Wilbur 2.5

Serial/ID No. :

EP2TIWILBU0452

Environment :

Humidity(%RH) : 53

Temperature (°C) : 24.1

Pressure (mmHg) : 745

Reference Standard:

Temperature Calibrator : DIGICON, model: CC-VTR-SH, Serial No.091109269

Flow Calibrator: Mesalabs Defender, model : 520-H , Serial No.164578

Leak Test : Pass

Diagnostic Check:

PM-10 Inlet	PM-2.5 Size Selective	Filter Cassette	Fan	Valve	Pump %
Pass	Pass	Pass	Pass	Pass	Pass

Result of Instrument Validation :

Calibrator Simulator					Temperature Measurement	
Temperature Audit and Adjust with Calibrator (°C)					Instrument	Reference
Set point	-10.0	0.0	20.0	45.0	Reading(Avg.)	TC Reading
ambient	-10.0	0.0	20.0	45.0	25.0	24.9
Filter	-10.0	0.0	20.0	45.0	29.6	29.5

Flow Control :

Calibration mode : AMB Flow Device

Flow set : 16.67 LPM

Avg. Pressure at Ref. : 746 mmHg.

Flow Measure (Avg.)	Flow Calibrator(Avg.10)	Flow Difference
16.67 LPM	16.64 LPM	0.03 LPM

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Engineer :

Sirirat Poonlak

Neediss Supply Instrument Co., Ltd.

Sarawut Keawsrinual

Issu Date:

1-Feb-23

Date:

1-Feb-23

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Neediss Supply Instrument Co., Ltd.

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Tel. 02-802-3980-2 Fax. 02-802-3988 E:info@neediss.com



Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6602006

Instrument :

PM-2.5 Sampler SINGLE

Validation Date:

1-Feb-23

Manufacturer :

Tisch Environmental

Model :

TE-Wilbur 2.5

Serial/ID No. :

EP2TIWILBU0479

Environment :

Humidity(%RH) : 52

Temperature (°C) : 24.1

Pressure (mmHg) : 745

Reference Standard:

Temperature Calibrator : DIGICON, model: CC-VTR-SH, Serial No.091109269

Flow Calibrator: Mesalabs Defender, model : 520-H , Serial No.164578

Leak Test : Pass

Diagnostic Check:

PM-10 Inlet	PM-2.5 Size Selective	Filter Cassette	Fan	Valve	Pump %
Pass	Pass	Pass	Pass	Pass	Pass

Result of Instrument Validation :

Calibrator Simulator					Temperature Measurement	
Temperature Audit and Adjust with Calibrator (°C)					Instrument	Reference
Set point	-10.0	0.0	20.0	45.0	Reading(Avg.)	TC Reading
ambient	-10.0	0.0	20.0	45.0	25.0	24.9
Filter	-10.0	0.0	20.0	45.0	29.6	29.5

Flow Control :

Calibration mode : AMB Flow Device

Flow set : 16.67 LPM

Avg. Pressure at Ref. : 746 mmHg

Flow Measure (Avg.)	Flow Calibrator(Avg.10)	Flow Difference
16.67 LPM	16.73 LPM	-0.06 LPM



Neediss Supply Instrument Co., Ltd

Engineer :

Sirir Poonlak

Approve By:

h

Sirir Poonlak

Sarawut Keawsrinal

Issu Date:

1-Feb-23

Date:

1-Feb-23

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Neediss Supply Instrument Co., Ltd.538 ซอยบางนา 7 แขวงบางนา เขตคลองเตย กรุงเทพฯ 10160 538 Soi Bangnae 7 Bangkhoe Bangkok Bangkok
Tel. 02-802-9980 2 Fax. 02-802-9983 Email: info@neediss.com

Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6602009

Instrument :

PM-2.5 Sampler SINGLE

Validation Date:

1-Feb-23

Manufacturer :

Tisch Environmental

Model :

TE-Wilbur 2.5

Serial/ID No. :

EP2TIWILBU0483

Environment :

Humidity(%RH):

50

Temperature (°C) :

23.8

Pressure (mmHg) :

745

Reference Standard:

Temperature Calibrator : DIGICON, model: CC-VTR-SH, Serial No.091109269

Flow Calibrator: Mesalabs Defender, model : 520-H , Serial No.164578

Leak Test :

Pass

Diagnostic Check:

PM-10 Inlet	PM-2.5 Size Selective	Filter Cassette	Fan	Valve	Pump %
Pass	Pass	Pass	Pass	Pass	Pass

Result of Instrument Validation :

Calibrator Simulator					Temperature Measurement	
Temperature Audit and Adjust with Calibrator (°C)					Instrument	Reference
Set point	-10.0	0.0	20.0	45.0	Reading(Avg.)	TC Reading
ambient	-10.0	0.0	20.0	45.0	25.0	24.9
Filter	-10.0	0.0	20.0	45.0	29.6	29.5

Flow Control :

Calibration mode : AMB Flow Device

Flow set : 16.67 LPM

Avg. Pressure at Ref. : 746 mmHg.

Flow Measure (Avg.)	Flow Calibrator(Avg.10)	Flow Difference
16.67 LPM	16.75 LPM	-0.08 LPM

neediss

Engineer :

Sirir Poonlak

Neediss Supply Instrument Co., Ltd.

Approve By:

Ph

Sirir Poonlak

Sarawat Keawsrinual

Issu Date:

1-Feb-23

Date:

1-Feb-23

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Neediss Supply Instrument Co., Ltd.535 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพมหานคร 10160 535 Soi Bangkhae 7 Bangkhae Bangkok Bangkok
Tel 02-802-3980-2 Fax 02-302-3932 E info@neediss.com

Verification Report of Ambient Air Sampling



PM



Onsite UTM :

Report No :

6602008

Instrument :

PM-2.5 Sampler SINGLE

Validation Date:

1-Feb-23

Manufacturer :

Tisch Environmental

Model :

TE-Wilbur 2.5

Serial/ID No. :

EP2TIWILBU0480

Environment :

Humidity(%RH) :

51

Temperature (°C) :

23.9

Pressure (mmHg) :

745

Reference Standard:

Temperature Calibrator : DIGICON, model: CC-VTR-SH, Serial No.091109269

Flow Calibrator: Mesalabs Defender, model : 520-H , Serial No.164578

Leak Test : Pass

Diagnostic Check:

PM-10 Inlet	PM-2.5 Size Selective	Filter Cassette	Fan	Valve	Pump %
Pass	Pass	Pass	Pass	Pass	Pass

Result of Instrument Validation :

Calibrator Simulator					Temperature Measurement	
Temperature Audit and Adjust with Calibrator (°C)					Instrument	Reference
Set point	-10.0	0.0	20.0	45.0	Reading(Avg.)	TC Reading
ambient	-10.0	0.0	20.0	45.0	25.0	24.9
Filter	-10.0	0.0	20.0	45.0	29.6	29.5

Flow Control :

Calibration mode : AMB Flow Device

Flow set; 16.67 LPM

Avg. Pressure at Ref. : 746 mmHg.

Flow Measure (Avg.)	Flow Calibrator(Avg.10)	Flow Difference
16.67 LPM	16.67 LPM	0 LPM



Engineer :

Sirirat Poonlak

Neediss Supply Instrument Co., Ltd.

/h

Sirirat Poonlak

Sarawut Keawsriniual

Issu Date:

1-Feb-23

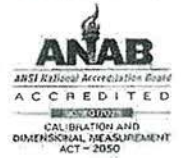
Date:

1-Feb-23

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Certificate of Calibration

Certificate Number : SPR23050051-1

Page : 1 of 3

Customer : Envilab Co., Ltd.

540, 540/1 Soi Bangkhuae 7, Bangkhuae, Bangkhuae Bangkok 10160

Equipment Name : Primary Flow Meter (Drycal)

Manufacturer : MesaLabs

Model : Defender 520-H

Serial Number : 164578

ID. Number : N/A

Environmental Conditions

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

Received Date : 04 May 2023

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

Calibration Date : 04 May 2023

Location of Calibration : In-Lab

Recommend Due Date : 04 May 2024

Calibration Procedure : SP-CPM-04-13

Date of Issue : 05 May 2023

Method of Calibration

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

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

Calibrated by : Mr. Jirasak Pumbut

Approved by :

Calibration Officer

(Mr. Prayoon Topart)

Authorized Signatory



Calibration Report

Certificate Number : SPR23050051-1

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Mass Flow Calibrator	AFC-COMplete-10	12532	AD2207-177-0001	17 Jul 2023
Standard Flow Meter	520-H	200353	MW-0071-22	25 Aug 2023

Traceability

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

MIT - Miracle International Technology Co.,Ltd.

MesaLabs - Mesa Laboratories, Inc.NVLEP Lab Code 200661-0 (ISO17025)



Result of Calibration

Certificate No. : SPR23050051-1

Range : 0 to 30 L/Min

Resolution : 0.0001 L/Min

Function : Air Flow Measurement

Calibration Point	UUC Reading	Standard Reading	UUC Error	K Factor Value	Uncertainty (±)
5.0	4.9722	4.9752	-0.0030	1.00060	0.050
10.0	10.296	10.325	-0.029	1.00282	0.10
15.0	15.076	15.037	0.039	0.99741	0.20
20.0	20.331	20.274	0.057	0.99720	0.20

Note:

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

Measurement Uncertainty

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

- End of Certificate -


Mettler-Toledo (Thailand) Limited
846/4 - 846/5 Lasalle Road
Bangna Tai, Bangna, Bangkok 10260
THAILAND
www.mt.com



NSC-TISI-TIS 17025
CALIBRATION 0062

Accuracy Calibration Certificate

Customer

Company: EnviLab Co., Ltd.
Address: 540, 540/1 Soi Bang Khae 7, Bang Khae
City: Bang Khae Contact: Phongsiri Jittawimon
Zip / Postal: 10160
State / Province: Bangkok
Order Number: 
0 3 3 2 9 3 5 4 6 0

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: XPR2 Asset Number: ELABBALANCEN07
Serial No.: C011158261 Terminal Model: PRT
Building: Lab Terminal Serial No.: C011158261
Floor: 3 Terminal Asset No.: N/A
Room: B-304 Balance Room

Range	Max. Capacity	Readability (d)
1	2.1 g	0.000001 g

Procedure


Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CP/W002/20

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.

The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.

In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature		Humidity	
As Found	Start: 23.7 °C	End: 23.6 °C	Start: 53.6 %	End: 54.8 %

As Found Calibration Date: 22-Mar-2024 Calibrator: Surachai P
As Left Calibration Date: N/A
Issue Date: 24-Mar-2024
Approved Signatory: 
Technical Manager / Head of Calibration Center

Measurement Results

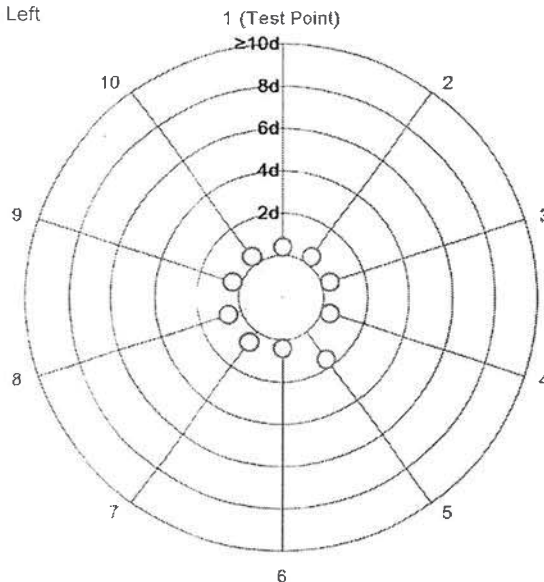
Repeatability

Test Load: 1 g

	As Found	As Left
1	1.000005 g	N/A
2	1.000005 g	N/A
3	1.000005 g	N/A
4	1.000005 g	N/A
5	1.000007 g	N/A
6	1.000005 g	N/A
7	1.000006 g	N/A
8	1.000006 g	N/A
9	1.000005 g	N/A
10	1.000005 g	N/A

Standard Deviation	0.000007 g	N/A
--------------------	------------	-----

○ As Found
◆ As Left



The "d" in the graph represents the readability of the range/interval in which the test was performed.

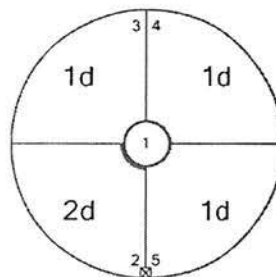
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 1 g

Position	As Found	As Left
1	1.000005 g	N/A
2	1.000007 g	N/A
3	1.000006 g	N/A
4	1.000006 g	N/A
5	1.000006 g	N/A

Maximum Deviation	0.000002 g	N/A
-------------------	------------	-----



As Found

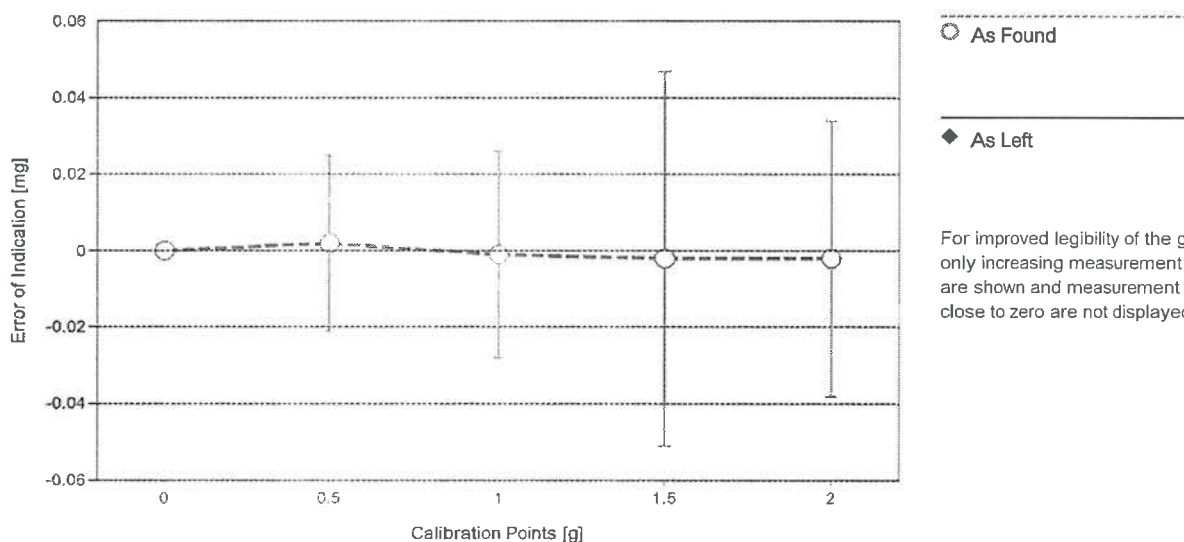
The "d" in the graph represents the readability of the range/interval in which the test was performed.

Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1 [*]	0.000000 g	0.000000 g	0.000000 g	0.0054 mg	2
2	0.001002 g	0.001003 g	0.000001 g	0.0056 mg	2
3	0.005002 g	0.005002 g	0.000000 g	0.0056 mg	2
4	0.010003 g	0.010003 g	0.000000 g	0.0073 mg	2
5	0.020002 g	0.020003 g	0.000001 g	0.0090 mg	2
6 [*]	0.050002 g	0.050002 g	0.000000 g	0.011 mg	2
7 [*]	0.100004 g	0.100005 g	0.000001 g	0.015 mg	2
8 [*]	0.500003 g	0.500005 g	0.000002 g	0.023 mg	2
9 [*]	1.000008 g	1.000007 g	-0.000001 g	0.027 mg	2
10	1.500011 g	1.500009 g	-0.000002 g	0.049 mg	2
11 [*]	2.000017 g	2.000015 g	-0.000002 g	0.036 mg	2

*The calculated uncertainty was replaced by the CMC (Calibration and Measurement Capabilities) value because the calculated uncertainty was smaller than the CMC value.



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated. The results of this calibration certificate relate only to the calibrated item.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.:	WS93	Date of Issue:	27-Jul-2023
Certificate Number:	C321203759-1	Calibration Due Date:	24-Nov-2024

Thermo Hygrometer

Equipment No.:	IN305	Date of Issue:	11-Oct-2023
Certificate Number:	SG-H-00655/66	Calibration Due Date:	08-Oct-2024

Remarks

FACT adjustment functionality activated
Equipment condition: Good
Next calibration according to customer's procedure
Calibration data not decide by calibration laboratoy

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $1.0 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: $4 K$

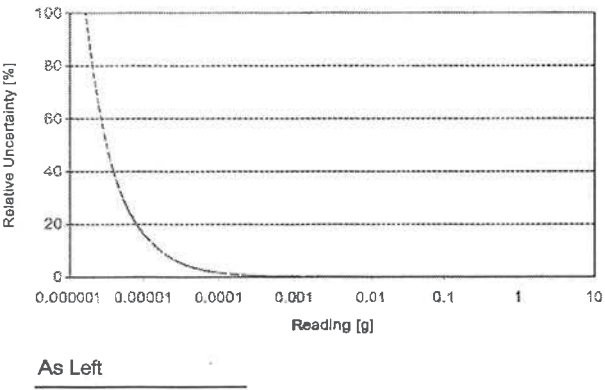
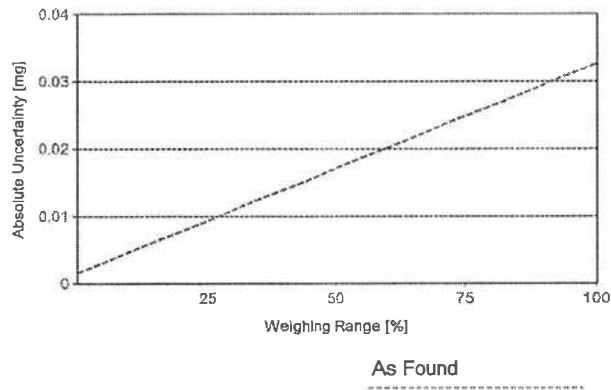
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.000001 g	2.1 g	$U_1 = 0.0016 \text{ mg} + 0.0148 \text{ mg/g} \cdot R$	N/A

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
0.000210 g	0.0016 mg	0.76%	N/A	N/A
0.002100 g	0.0016 mg	0.078%	N/A	N/A
0.021000 g	0.0019 mg	0.0091%	N/A	N/A
0.210000 g	0.0047 mg	0.0022%	N/A	N/A
2.100000 g	0.033 mg	0.0016%	N/A	N/A



GWP® Certificate



As
Found



As
Left



The weighing device meets the given
process requirements.

The weighing device meets the given
process requirements.

Tests Performed:



As Found



As Left



No adjustments/modifications made. As Left results
correspond to As Found.

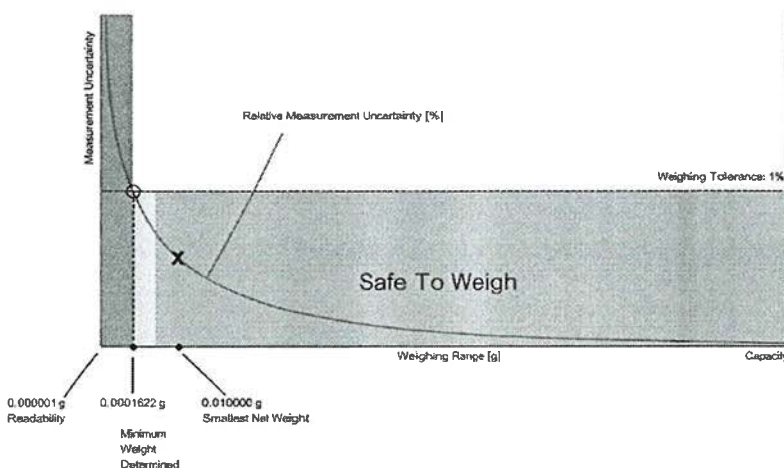
Process Requirements

Weighing Tolerance: 1 %

Smallest Net Weight: 0.010000 g

Safety Factor: 2

Safe Weighing Range



While the values in this graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. This graph reflects As Left testing, unless only As Found was performed.

Minimum Weight

As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.0016436 g	0.0033373 g	0.0050834 g	0.0087427 g	0.0190016 g
0.2%	0.0008157 g	0.0016436 g	0.0024841 g	0.0042036 g	0.0087427 g
0.5%	0.0003248 g	0.0006516 g	0.0009803 g	0.0016436 g	0.0033373 g
1%	0.0001622 g	0.0003248 g	0.0004880 g	0.0008157 g	0.0016436 g
2%	0.0000810 g	0.0001622 g	0.0002434 g	0.0004063 g	0.0008157 g
5%	0.0000324 g	0.0000648 g	0.0000972 g	0.0001622 g	0.0003248 g



Pass: The determined minimum weight meets the requirement for the smallest net weight.

As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.0016436 g	0.0033373 g	0.0050834 g	0.0087427 g	0.0190016 g
0.2%	0.0008157 g	0.0016436 g	0.0024841 g	0.0042036 g	0.0087427 g
0.5%	0.0003248 g	0.0006516 g	0.0009803 g	0.0016436 g	0.0033373 g
1%	0.0001622 g	0.0003248 g	0.0004880 g	0.0008157 g	0.0016436 g
2%	0.0000810 g	0.0001622 g	0.0002434 g	0.0004063 g	0.0008157 g
5%	0.0000324 g	0.0000648 g	0.0000972 g	0.0001622 g	0.0003248 g



Pass: The determined minimum weight meets the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with $k = 2$ and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

Notes on minimum weight values in above table:

1. If "N/A" is shown above, no appropriate value could be calculated.
2. METTLER TOLEDO is not responsible for the definition of the process requirements.

Measurement Results

Results Summary

	Repeatability	Eccentricity	Error of Indication
As Found	✓	✓	✓
As Left	✓	✓	✓

✓ = Passed

✗ = Failed

⚠ = Safety Factor not met

Repeatability

Test Load: 1 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	0.0000050 g	0.0000007 g	✓	0.0000007 g	✓
0.2%	0.0000100 g		✓		✓
0.5%	0.0000250 g		✓		✓
1%	0.0000500 g		✓		✓
2%	0.0001000 g		✓		✓
5%	0.0002500 g		✓		✓

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

Eccentricity

Test Load: 1 g

Tolerance	Control Limit	As Found		As Left	
		Deviation	Result	Deviation	Result
0.1%	0.000500 g	0.000002 g	✓	0.000002 g	✓
0.2%	0.001000 g		✓		✓
0.5%	0.002500 g		✓		✓
1%	0.005000 g		✓		✓
2%	0.010000 g		✓		✓
5%	0.025000 g		✓		✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

Error of Indication

As Found

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.000000 g	0.000000 g	N/A	N/A	N/A	N/A	N/A	N/A
0.500003 g	0.000002 g	0.000250 g	0.000500 g	0.001250 g	0.002500 g	0.005000 g	0.012500 g
1.000008 g	-0.000001 g	0.000500 g	0.001000 g	0.002500 g	0.005000 g	0.010000 g	0.025000 g
1.500011 g	-0.000002 g	0.000750 g	0.001500 g	0.003750 g	0.007500 g	0.015000 g	0.037500 g
2.000017 g	-0.000002 g	0.001000 g	0.002000 g	0.005000 g	0.010000 g	0.020000 g	0.050000 g
Result		✓	✓	✓	✓	✓	✓

As Left

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.000000 g	0.000000 g	N/A	N/A	N/A	N/A	N/A	N/A
0.500003 g	0.000002 g	0.000250 g	0.000500 g	0.001250 g	0.002500 g	0.005000 g	0.012500 g
1.000008 g	-0.000001 g	0.000500 g	0.001000 g	0.002500 g	0.005000 g	0.010000 g	0.025000 g
1.500011 g	-0.000002 g	0.000750 g	0.001500 g	0.003750 g	0.007500 g	0.015000 g	0.037500 g
2.000017 g	-0.000002 g	0.001000 g	0.002000 g	0.005000 g	0.010000 g	0.020000 g	0.050000 g
Result		✓	✓	✓	✓	✓	✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.



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CALIBRATION CERTIFICATE

Certificate No. : L202306169-001

Date Issued : 30-Jun-23

Customer : Envilab Co.,Ltd.
540, 540/1 Soi Bangkhae 7, Bangkhae, Bangkok, Thailand 10160

Equipment : Temperature Calibrator

Manufacturer : Digicon

Model : CC-VTR-SH

Serial No. : 091109269

ID No./Tag No. : -

Date Received : 21-Jun-23

Date Calibrated : 24-Jun-23

Calibrated by : Ms. Sunisa Pinklao

Calibration Method or Calibration Procedure Used

In-house method : CP-126 base on EURAMET/cg-11 by direct measurement with Reference Multi Meter

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

Result of Calibration

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

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

Approved by:

Sarayuth T.

(Mr. Sarayuth Tochua)



Certificate No. : L202306169-001

Environment : Ambient Temperature.: $(23 \pm 2) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15)\%\text{RH}$

Function : Temperature Simulate (Thermocouple Type K)

Calibration Point	Standard Value	Error	\pm Uncertainty	tolerance limit
-18.0 $^\circ\text{C}$	-17.71 $^\circ\text{C}$	-0.29 $^\circ\text{C}$	0.29 $^\circ\text{C}$	-18.75 $^\circ\text{C}$ ~ -17.25 $^\circ\text{C}$
0.0 $^\circ\text{C}$	0.24 $^\circ\text{C}$	-0.24 $^\circ\text{C}$	0.29 $^\circ\text{C}$	-0.75 $^\circ\text{C}$ ~ 0.75 $^\circ\text{C}$
50.0 $^\circ\text{C}$	50.25 $^\circ\text{C}$	-0.25 $^\circ\text{C}$	0.29 $^\circ\text{C}$	49.25 $^\circ\text{C}$ ~ 50.75 $^\circ\text{C}$
500.0 $^\circ\text{C}$	500.21 $^\circ\text{C}$	-0.21 $^\circ\text{C}$	0.38 $^\circ\text{C}$	499.25 $^\circ\text{C}$ ~ 500.75 $^\circ\text{C}$
1100.0 $^\circ\text{C}$	1100.19 $^\circ\text{C}$	-0.19 $^\circ\text{C}$	0.52 $^\circ\text{C}$	1099.25 $^\circ\text{C}$ ~ 1100.75 $^\circ\text{C}$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

NA Cal. Certificate No. EIU224859 for Multi-Product Calibrator Serial No. 9115027, Due 24-Oct-23

End of Certificate



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SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6702003

Calibrated Date: 1-Feb-24

☒ PM ☐ Onsite

Instruments Information

Page: 1/2

Analyzer Type: SO2 Analyzer Model: 100E	Manufacturer API S/N: ESOAI100E01218
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Calibration System

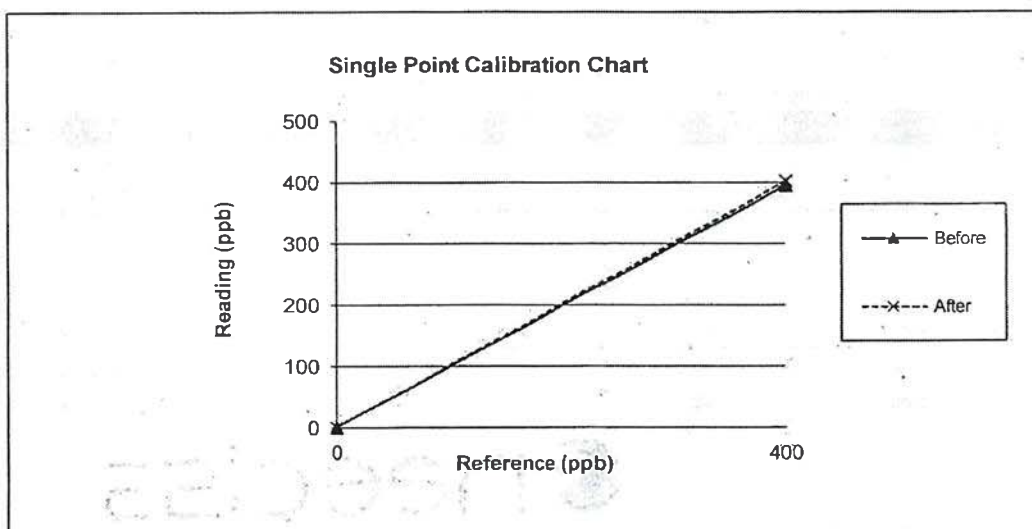
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NOx Conc 45.50 PPM NO Conc 45.50 PPM SO2 Conc 45.59 PPM CO Conc 4500 PPM Expire Date: Mar 31, 2026 EB0160267

Environment: Temperature 26.2 °C

Humidity: 62 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	0.8	0.8	400.0	395.0	-0.6
After	0.0	0.5	0.5	400.0	402.0	0.2



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SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6702003

Calibrated Date: 1-Feb-24

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Page:2/2

Date	1-Feb-24				
Time	13:10				
Range	50 - 20000	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.6	0.2	
Sample Flow	650 (+/- 50)	cc/min	663	659	
PMT Detector	0 - 5000	mV	36.5	34.5	
Norm PMT Detector	0 - 5000	mV	34.1	32.8	
HVPS	400-900 constant	V	719	648	
DCPS	2500 (+/- 200)	mV	-	-	
RCELL TEMP	50 (+/- 1)	Dreegee C	50	50	
BOX TEMP	20-40	Dreegee C	34.1	32.7	
PMT TEMP	7 (+/-1)	Dreegee C	8.0	8.0	
UV lamp	1000-4900	mV	4034.0	4034.0	
Lamp Ratio	30-120	%	114.0	114.0	
STR. Light (Zero Gas)	<100	PPB	29	29	
Dark PMT	(-50) - (+200)	mV	44.7	44.7	
Dark lamp	(-50) - (+200)	mV	5.1	5.1	
SAMP PRES	20-30 constant	IN-Hg-A	28.1	27.8	
PMT Volts	2000 (+/- 500)	mV	2004	2020	
SO2 Conc	1000 (+/- 250)	PPB	1002	1010	
SO2 Slope	1 (+/- 0.3)	-	0.920	0.866	
SO2 Offset	< 250	mV	65	130.1	
Stability at Zero	< 0.2	PPB	0.1	0.1	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.6	0.2	
Zero Gas (0.00 PPB)	0	ppb	0.8	0.5	
Span Gas (400 PPB)	400	ppb	395.0	402.0	± 5% of Range

Calibrate By: _____

Sirirat Poonlak

Date:

1-Feb-24

Approve By: _____

Sarawut Keawsrinal

Date:

1-Feb-24

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SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6702004

Calibrated Date: 1-Feb-24

☒ PM ☐ Onsite

Instruments Information

Page: 1/2

Analyzer Type: SO2 Analyzer Model: 100E	Manufacturer API S/N: ESOAI100E01225
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Calibration System

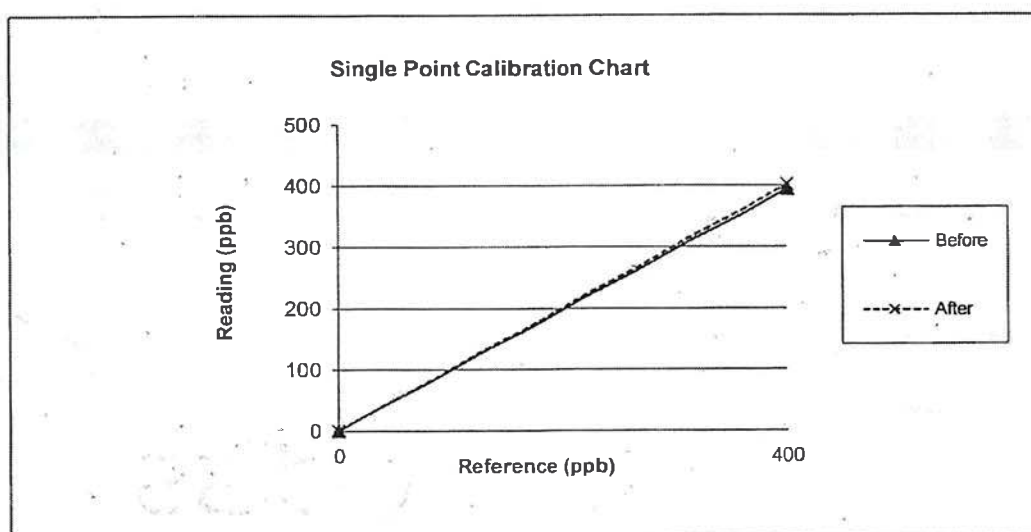
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NOx Conc 46.50 PPM NO Conc 46.50 PPM SO2 Conc 45.59 PPM CO Conc 4507 PPM Expire Date: Mar 31, 2026 EB0160267

Environment: Temperature 26.6 °C

Humidity: 62 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	0.9	0.9	400.0	394.0	-0.8
After	0.0	0.6	0.6	400.0	402.0	0.2





SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6702004

Calibrated Date: 1-Feb-24

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Page:2/2

Date	1-Feb-24				
Time	13:10				
Range	50 - 20000	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.6	0.2	
Sample Flow	650 (+/- 50)	cc/min	663	659	
PMT Detector	0 - 5000	mV	36.5	34.5	
Norm PMT Detector	0 - 5000	mV	34.1	32.8	
HVPS	400-900 constant	V	719	648	
DCPS	2500 (+/- 200)	mV			
RCELL TEMP	50 (+/- 1)	Dreegee C	50	50	
BOX TEMP	20-40	Dreegee C	34.1	32.7	
PMT TEMP	7 (+/-1)	Dreegee C	8.0	8.0	
UV lamp	1000-4900	mV	4034.0	4034.0	
Lamp Ratio	30-120	%	114.0	114.0	
STR. Light (Zero Gas)	<100	PPB	29	29	
Dark PMT	(-50) - (+200)	mV	44.7	44.7	
Dark lamp	(-50) - (+200)	mV	5.1	5.1	
SAMP PRES	20-30 contant	IN-Hg-A	28.1	27.8	
PMT Volts	2000 (+/- 500)	mV	2004	2020	
SO2 Conc	1000 (+/- 250)	PPB	1002	1010	
SO2 Slope	1 (+/- 0.3)		0.920	0.866	
SO2 Offset	< 250	mV	65	130.1	
Stability at Zero	< 0.2	PPB	0.1	0.1	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.6	0.2	
Zero Gas (0.00 PPB)	0	ppb	0.9	0.6	
Span Gas (400 PPB)	400	ppb	394.0	402.0	± 5% of Range

Calibrate By :

Sirirat Poonlak

Date:

1-Feb-24

Approve By :

Sarawut Keawsrinal

Date:

1-Feb-24


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S02 Analyzer Verification Test Report

Calibration Report No.: AP-S6702005

Calibrated Date: 1-Feb-24

☒ PM ☐ Onsite

Instruments Information

Page:1/2

Analyzer Type: SO2 Analyzer Model: 100E	Manufacturer API S/N: ESOAI100E01108
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Calibration System

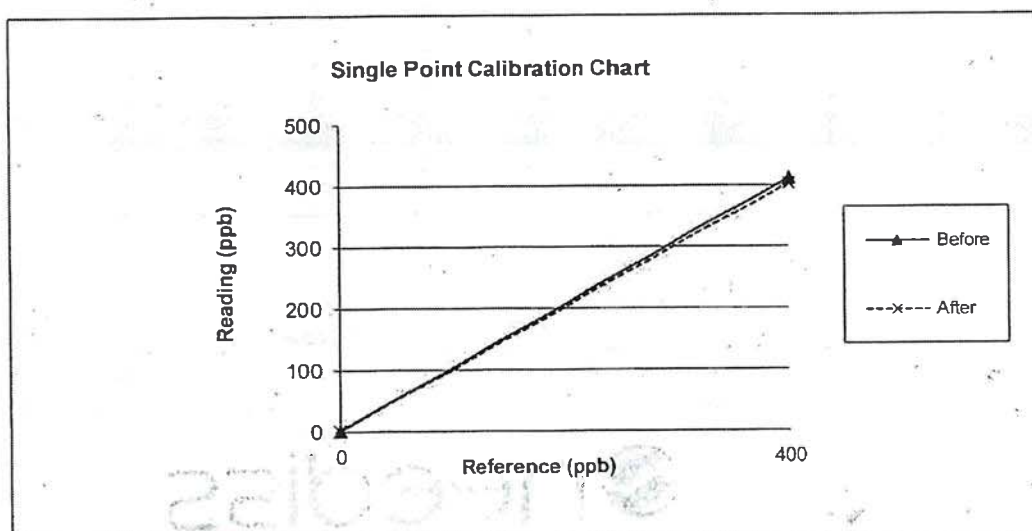
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NOx Conc 45.50 PPM NO Conc 45.50 PPM SO2 Conc 45.59 PPM CO Conc 4500 PPM Expire Date: Mar 31,2026 EB0160267

Environment: Temperature 26.7 °C

Humidity: 62 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	1.5	1.5	400.0	412.0	1.5
After	0.0	0.8	0.8	400.0	403.0	0.4





SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6702005

Calibrated Date: 1-Feb-24

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Page:2/2

Date	1-Feb-24				
Time	13:10				
Range	50 - 20000	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.6	0.2	
Sample Flow	650 (+/- 50)	cc/min	663	659	
PMT Detector	0 - 5000	mV	36.5	34.5	
Norm PMT Detector	0 - 5000	mV	34.1	32.8	
HVPS	400-900 constant	V	719	648	
DCPS	2500 (+/- 200)	mV	-	-	
RCCELL TEMP	50 (+/- 1)	Dreegee C	50	50	
BOX TEMP	20-40	Dreegee C	34.1	32.7	
PMT TEMP	7 (+/-1)	Dreegee C	8.0	8.0	
UV lamp	1000-4900	mV	4034.0	4034.0	
Lamp Ratio	30-120	%	114.0	114.0	
STR. Light (Zero Gas)	<100	PPB	29	29	
Dark PMT	(-50) - (+200)	mV	44.7	44.7	
Dark lamp	(-50) - (+200)	mV	5.1	5.1	
SAMP PRES	20-30 contant	IN-Hg-A	28.1	27.8	
PMT Volts	2000 (+/- 500)	mV	2004	2020	
SO2 Conc	1000 (+/- 250)	PPB	1002	1010	
SO2 Slope	1 (+/- 0.3)	-	0.920	0.866	
SO2 Offset	< 250	mV	65	130.1	
Stability at Zero	< 0.2	PPB	0.1	0.1	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.6	0.2	
Zero Gas (0.00 PPB)	0	ppb	1.5	0.8	
Span Gas (400 PPB)	400	ppb	412.0	403.0	± 5% of Range

Calibrate By : _____

Sirirat Poonlak

Date:

1-Feb-24

Approve By : _____

Sarawut Keawsrinal

Date:

1-Feb-24



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S02 Analyzer Verification Test Report

Calibration Report No.: ES-S6702006

Calibrated Date: 1-Feb-24

☒ PM ☐ Onsite

Instruments Information

Page:1/2

Analyzer Type: SO2 Analyzer Model: AF22e	Manufacturer: Environnement SA., France S/N: NSOESA AF32E454
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Calibration System

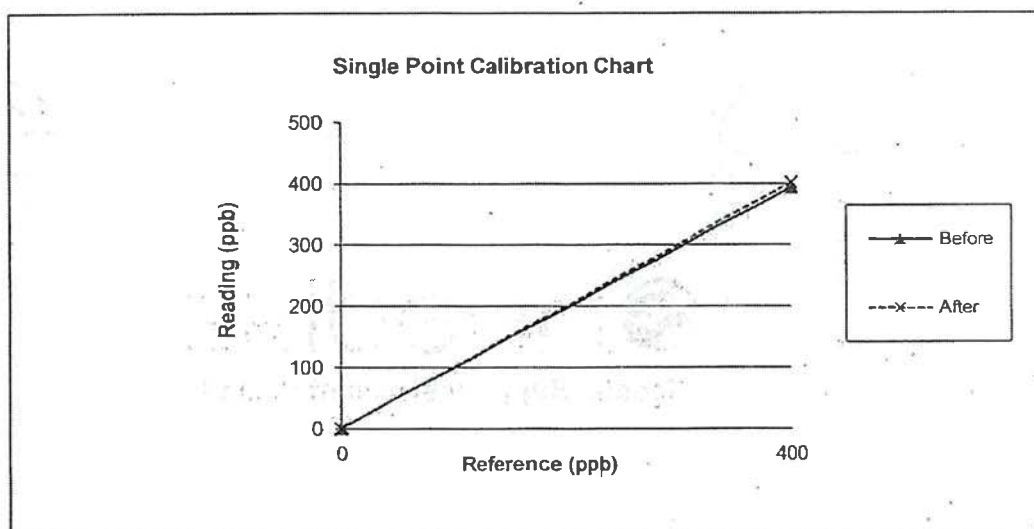
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NOx Conc 46.50 PPM NO Conc 46.50 PPM SO2 Conc 45.59 PPM CO Conc 4507 PPM Expire Date: Mar 31, 2026 EB0160267

Environment: Temperature 26.7 °C

Humidity: 62 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	1.3	1.3	400.0	394.0	-0.8
After	0.0	0.2	0.2	400.0	402.0	0.2





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Neediss Supply Instrument Co., Ltd.

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Tel. 02-802-6980-2 Fax. 02-802-6980 Email: neediss.com



SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6702006

Calibrated Date: 1-Feb-24

☒ PM ☐ Onsite

Page: 2/2

Analyzer Signal Values					
Date	1-Feb-24	Time	13:11:00		
Power Supplies					
Option	0.00	mV	+5 V Sensor	5	V
+4 V	4068	mV	+3.3 V	3.3	V
+24 V	24.1	V	+12 V	11.9	V
+5 V	5	V	I UV lamp	44.3	mA
I+24 V	1.2	A			
Optical Bench					
Dark UV sig.	0	mV	Dark PM sig.	88	mV
UV ref.	0	mV	PM ref.	0	mV
UV sig.	24.1	mV	PM sig.	138.6	mV
Ref. ratio	0		Meas ratio	0.34	
Mean sig.	0.7		Raw trend	11	
Raw sig.	24.4	ppb	inst.meas.	22.8	ppb
I UV Lamp	44.7	mA	HV PM	2626.80	mV
Sample					
Internal Temp.	31.9	deg.C	Chamber T.	50	deg.C
Gas Pr.	970	hPa	Pump Pr.	355.5	hPa
Flow	18.7	l/h			

Calibrate By:

Sirirat Poonlak

Date:

1-Feb-24

Approve By:

Sarawut Keawsrinual

Date:

1-Feb-24

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SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6702007

Calibrated Date: 1-Feb-24

☒ PM ☐ Onsite

Page:1/2

Instruments Information

Analyzer Type: SO2 Analyzer Model: AF22e	Manufacturer: Environnement SA., France S/N: NSOESAAF32E453
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Calibration System

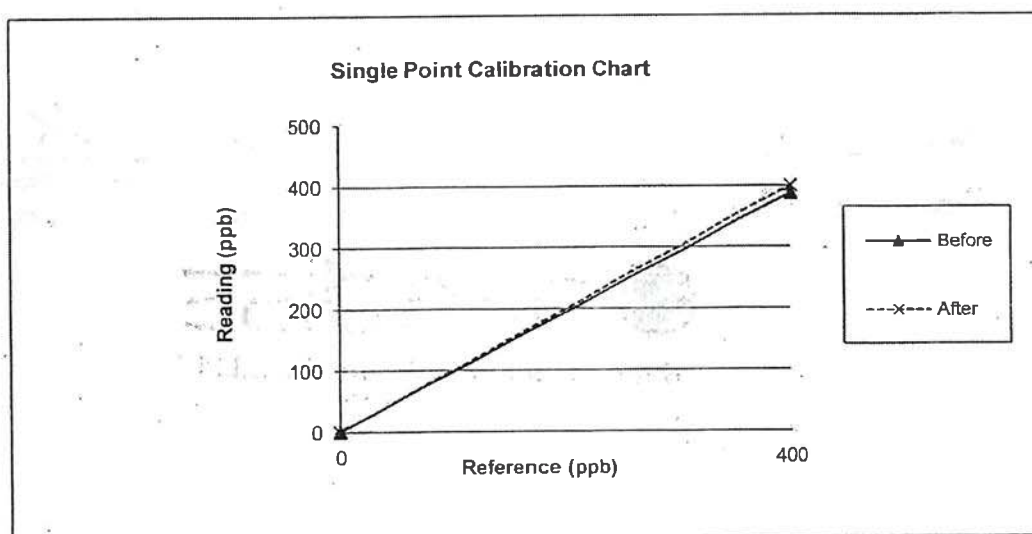
Calibrator Unit	Standard Gas
Dilutor Model: ESA MGC101 S/N: 792 ZERO AIR Generator: ZAG7001 S/N: 644	NOx Conc: 45.50 PPM NO Conc: 45.50 PPM SO2 Conc: 45.59 PPM CO Conc: 4500 PPM Expire Date: Mar 31, 2026 EB0160267

Environment: Temperature 26.7 °C

Humidity: 61 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	1.0	1.0	400.0	388.0	-1.5
After	0.0	0.4	0.4	400.0	400.0	0.0





SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6702007

Calibrated Date: 1-Feb-24

☒ PM ☐ Onsite

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Date	1-Feb-24	Time	13:11:00		
Option	0.00	mV	+5 V Sensor	5	V
+4 V	4068	mV	+3.3 V	3.3	V
+24 V	24.1	V	+12 V	11.9	V
+5 V	5	V	I UV lamp	44.3	mA
I+24 V	1.2	A			
Dark UV sig.	0	mV	Dark PM sig.	88	mV
UV ref.	0	mV	PM ref.	0	mV
UV sig.	24.1	mV	PM sig.	138.6	mV
Ref.ratio	0		Meas ratio	0.34	
Mean sig.	0.7		Raw trend	11	
Raw sig.	24.4	ppb	inst.meas.	22.8	ppb
I UV Lamp	44.7	mA	HV PM	2626.80	mV
Internal Temp.	31.9	deg.C	Chamber T.	50	deg.C
Gas Pr.	970	hPa	Pump Pr.	355.5	hPa
Flow	18.7	l/h			

Calibrate By:



Sirirat Poonlak

Date:

1-Feb-24

Approve By:



Sarawut Keawsrinal

Date:

1-Feb-24


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Neediss Supply Instrument Co., Ltd.

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Tel. 02-802-3980-2 Fax. 02-802-3985 E: info@neediss.com



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6702001

Page:1/1

Calibrated Date: 1-Feb-24

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: T200	Manufacturer API S/N: ENOAIT20002469
---	---

Calibration System

Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NOx Conc 46.50 PPM NO Conc 46.50 PPM So2 Conc 45.59 PPM Co Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267

Environment: Temperature 24.7 °C

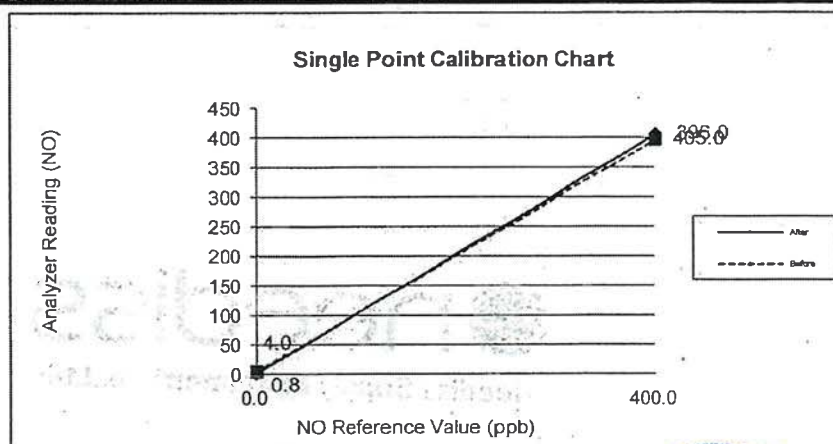
Humidity: 65 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	2.7	0.0	2.7	386.6	400.0	-1.7
NO ₂	1.3	0.0	1.3	9.4	0.0	1.2
NOx	4.0	0.0	4.0	396.0	400.0	-0.5

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.6	0.0	0.6	403.0	400.0	0.4
NO ₂	0.2	0.0	0.2	2.0	0.0	0.2
NOx	0.8	0.0	0.8	405.0	400.0	0.6





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Tel. 02-802-9789-2 Fax. 02-802-9785 E-mail: neediss.com



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6702001

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Calibrated Date: 1-Feb-24

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Test Function Value	Normal range	Unit	Before	After	Note
Date	1-Feb-24				
Time	13:30:00 AM				
Range	0.00 - 500.00 PPB	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.5	0.2	
Sample Flow	500 +/- 50	cc/min	505	480	
Ozone Flow	60-90	cc/min	79	72	
PMT Detector	0-5000	mV	26.2	29.3	
AZERO	-20-150	mV	56.0	55.0	
HVPS	400-900 constant	V	755	755	
DCPS	2500 +/- 200	mV	-	-	
RCELL TEMP	50 +/- 1	Dreegee C	50	50	
BOX TEMP	20-35	Dreegee C	30.2	32.0	
PMT TEMP	7 +/- 1	Dreegee C	7.2	7.2	
IZS TEMP	50 +/- 4	Dreegee C	-	-	
MOLY Temp	315 +/- 5	Dreegee C	315.0	315.0	
RCEL PRES	4-10 contant	IN-Hg-A	4	5	
SAMP PRES	20-30 contant	IN-Hg-A	29	29	
NO Slope	1 +/- 0.3		0.890	1.118	
Nox Slope	1 +/- 0.3		0.911	1.046	
NO Offset	-10 to + 150	mV	12.9	2.2	
NOx Offset	-10 to + 150	mV	-2.4	9.1	
Span and Cal Values					
Zero Value	NO	0	ppb	2.7	0.6
	NOx	0	ppb	4.0	0.8
Span Value	NO	400	ppb	386.6	403.0
	NOx	400	ppb	396.0	405.0

Calibrate By:

Sirirat Poonlak

Date:

1-Feb-24

Approve By:

Sarawat Keawsrinual

Date:

1-Feb-24



Neediss Supply Instrument Co., Ltd.



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6702002

Page:1/1

Calibrated Date: 1-Feb-24

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: 200E	Manufacturer API S/N: ENOAI200E01526
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Calibration System

Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO _x Conc 46.50 PPM NO Conc 46.50 PPM So ₂ Conc 45.59 PPM CO 4507 PPM Expire Date: Mar 31,2026 EB0160267

Environment: Temperature 26.6 °C

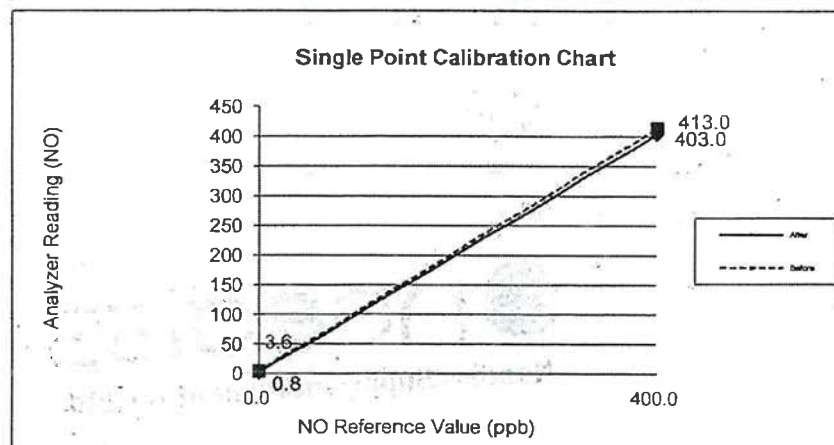
Humidity: 64 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	2.8	0.0	2.8	410.0	400.0	1.2
NO ₂	0.8	0.0	0.8	3.0	0.0	0.4
NO _x	3.6	0.0	3.6	413.0	400.0	1.6

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.4	0.0	0.4	401.0	400.0	0.1
NO ₂	0.4	0.0	0.4	2.0	0.0	0.2
NO _x	0.8	0.0	0.8	403.0	400.0	0.4





NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6702002

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Calibrated Date: 1-Feb-24

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Date	1-Feb-24				
Time	13:30				
Range	0.00 - 500.00 PPB	PPB	500.0	500.0	
Stability (Zero Gas)	< 0.2	PPB	0.8	0.2	
Sample Flow	500 +/- 50	cc/min	470.0	476.0	
Ozone Flow	60-90	cc/min	90.0	76.0	
PMT Detector	0-5000	mV	24.8	19.6	
AZERO	-20-150	mV	11.7	7.3	
HVPS	400-900 constant	V	768.0	714.0	
DCPS	2500 +/- 200	mV	-	-	
RCELL TEMP	50 +/- 1	Dreegee C	50.3	50.3	
BOX TEMP	20-35	Dreegee C	28.0	27.5	
PMT TEMP	7 +/- 1	Dreegee C	7.7	7.8	
IZS TEMP	50 +/- 4	Dreegee C	-	-	
MOLY Temp	315 +/- 5	Dreegee C	313.1	315.0	
RCEL PRES	4-10 contant	IN-Hg-A	7.30	7.30	
SAMP PRES	20-30 contant	IN-Hg-A	31.4	31.3	
NO Slope	1 +/- 0.3		0.647	0.963	
Nox Slope	1 +/- 0.3		0.652	0.940	
NO Offset	-10 to + 150	mV	17.40	6.60	
NOx Offset	-10 to + 150	mV	24.10	12.70	
Zero Value	NO	0	ppb	2.8	0.4
	NOx	0	ppb	3.6	0.8
Span Value	NO	400	ppb	410.0	401.0
	NOx	400	ppb	413.0	403.0

Calibrate By :

Sirirat Poonlak

Date :

1-Feb-24

Approve By :

Sarawat Keawsrinal

Date :

1-Feb-24


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Tel. 02-802-3980-4 Fax. 02-802-3988 E:info@neediss.com



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6702003

Page:1/1

Calibrated Date: 1-Feb-24

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Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: 200A	Manufacturer API S/N: ENOAI200A02600
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Calibration System

Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NOx Conc 46.50 PPM NO Conc 46.50 PPM So2 Conc 45.59 PPM CO Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267

Environment: Temperature 26.5 °C

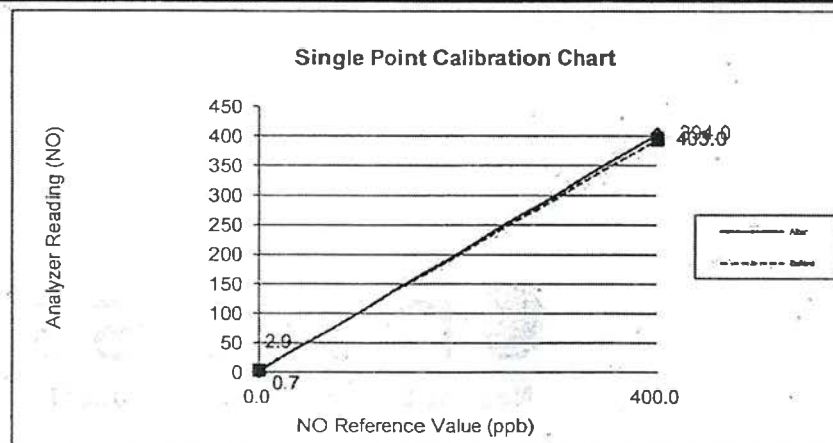
Humidity: 64 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	2.1	0.0	2.1	380.2	400.0	-2.5
NO ₂	0.8	0.0	0.8	13.8	0.0	1.8
NOx	2.9	0.0	2.9	394.0	400.0	-0.8

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.6	0.0	0.6	400.0	400.0	0.0
NO ₂	0.1	0.0	0.1	3.0	0.0	0.4
NOx	0.7	0.0	0.7	403.0	400.0	0.4





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Neediss Supply Instrument Co., Ltd.

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Tel 02-802-3960-2 Fax 02-802-3966 Email: neediss@neediss.com



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6702003

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Calibrated Date: 1-Feb-24

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Test Function Value	Norminal range	Unit	Before	After	Note
Date	1-Feb-24				
Time	11:20				
Range	0.00 - 500.00 PPB	PPB	500.0	500.0	
Stability (Zero Gas)	< 0.2	PPB	0.8	0.2	
Sample Flow	500+/- 50	cc/min	470.0	476.0	
Ozone Flow	60-90	cc/min	90.0	76.0	
PMT Detector	0-5000	mV	24.8	19.6	
AZERO	-20-150	mV	11.7	7.3	
HVPS	400-900 constant	V	768.0	714.0	
DCPS	2500 +/- 200	mV	-	-	
RCELL TEMP	50+/- 1	Dreegee C	50.3	50.3	
BOX TEMP	20-35	Dreegee C	28.0	27.5	
PMT TEMP	7 +/-1	Dreegee C	7.7	7.8	
IZS TEMP	50+/- 4	Dreegee C	-	-	
MOLY Temp	315 +/- 5	Dreegee C	313.1	315.0	
RCEL-PRES	4-10 contant	IN-Hg-A	7.30	7.30	
SAMP PRES	20-30 contant	IN-Hg-A	31.4	31.3	
NO Slope	1 +/- 0.3		0.647	0.963	
Nox Slope	1 +/- 0.3		0.652	0.940	
NO Offset	-10 to + 150	mV	17.40	6.60	
NOx Offset	-10 to + 150	mV	24.10	12.70	
Span and Cal Values					
Zero Value	NO	0	ppb	2.1	0.6
	NOx	0	ppb	2.9	0.7
Span Value	NO	400	ppb	380.2	400.0
	NOx	400	ppb	394.0	403.0

Calibrate By:

Sirirat Poonlak

Date:

1-Feb-24

Approve By:

Sarawat Keawsrinual

Date:

1-Feb-24

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Neediss Supply Instrument Co.,Ltd



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บริษัท นีดิส ซัพพลาย อินสตรูमेंท์ จำกัด
Neediss Supply Instrument Co., Ltd.

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NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6702004

Page:1/1

Calibrated Date: 1-Feb-24

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: 200E	Manufacturer API S/N: ENOAI200E00579
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Calibration System

Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NOx Conc 46.50 PPM NO Conc 46.50 PPM So2 Conc 45.59 PPM CO Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267

Environment: Temperature 26.5 °C

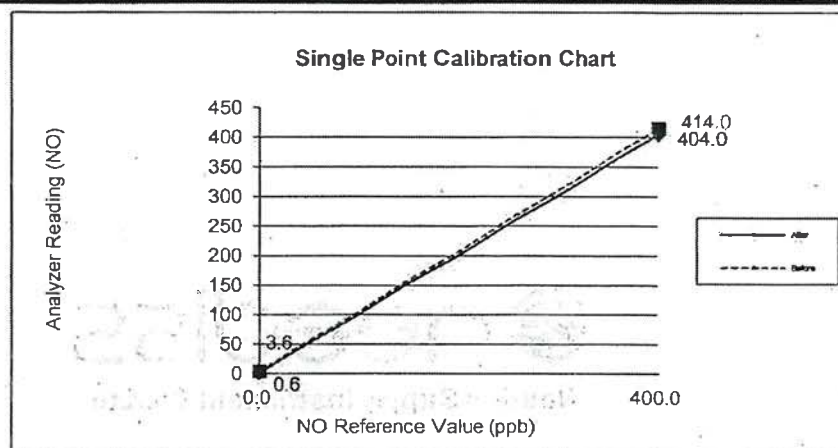
Humidity: 61 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	2.7	0.0	2.7	411.0	400.0	1.4
NO ₂	0.9	0.0	0.9	3.0	0.0	0.4
NOx	3.6	0.0	3.6	414.0	400.0	1.7

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.5	0.0	0.5	402.0	400.0	0.2
NO ₂	0.1	0.0	0.1	2.0	0.0	0.2
NOx	0.6	0.0	0.6	404.0	400.0	0.5





NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6702004

Page:1/1

Calibrated Date: 1-Feb-24

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Test Function Value	Normal range	Unit	Before	After	Note
Date	1-Feb-24				
Time	13:25				
Range	0.00 - 500.00 PPB	PPB	500.0	500.0	
Stability (Zero Gas)	< 0.2	PPB	0.5	0.2	
Sample Flow	500+/- 50	cc/min	474.0	441.0	
Ozone Flow	60-90	cc/min	76.0	76.0	
PMT Detector	0-5000	mV	24.5	62.2	
AZERO	-20-150	mV	8.6	67.5	
HVPS	400-900 constant	V	839.0	836.0	
DCPS	2500 +/- 200	mV	-	-	
RCELL TEMP	50+/- 1	Dreegee C	50.0	50.0	
BOX TEMP	20-35	Dreegee C	34.5	30.5	
PMT TEMP	7 +/-1	Dreegee C	7.0	7.1	
IZS TEMP	50+/- 4	Dreegee C	-	-	
MOLY Temp	315 +/- 5	Dreegee C	315.0	314.4	
RCEL PRES	4-10 contant	IN-Hg-A	4.20	7.90	
SAMP PRES	20-30 contant	IN-Hg-A	29.9	28.6	
NO Slope	1 +/- 0.3		1.256	1.032	
Nox Slope	1 +/- 0.3		1.232	1.048	
NO Offset	-10 to + 150	mV	4.50	6.90	
NOx Offset	-10 to + 150	mV	-5.00	-1.50	
Span and Cal Values					
Zero Value	NO	0	ppb	2.7	0.5
	NOx	0	ppb	3.6	0.6
Span Value	NO	400	ppb	411.0	402.0
	NOx	400	ppb	414.0	404.0

Calibrate By :

Sirirat Poonlak

Date:

1-Feb-24

Approve By :

Sarawut Keawsrinual

Date:

1-Feb-24



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6702005

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Calibrated Date: 1-Feb-24



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Onsite

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: 200A	Manufacturer API S/N: ENOAI200E01170
---	---

Calibration System

Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NOx Conc 46.50 PPM NO Conc 46.50 PPM So2 Conc 45.59 PPM Co Conc 4507 PPM Expire Date: Mar 31,2026 EB0160267

Environment: Temperature 26.5 °C

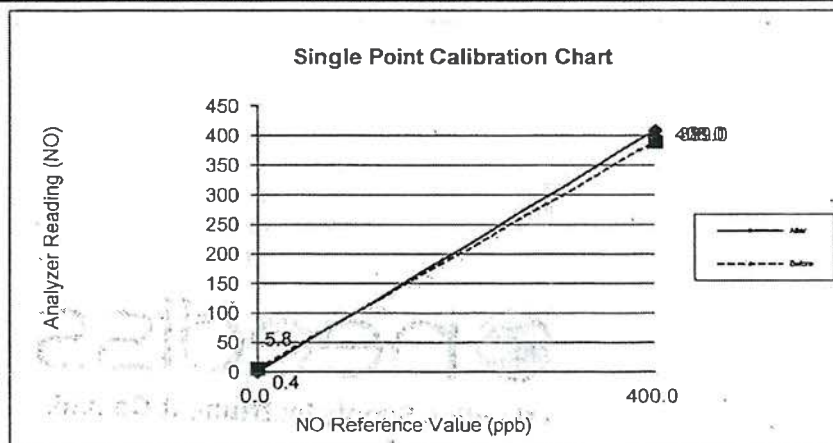
Humidity: 60 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	3.9	0.0	3.9	382.0	400.0	-2.3
NO ₂	1.9	0.0	1.9	7.0	0.0	0.9
NOx	5.8	0.0	5.8	389.0	400.0	-1.4

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.2	0.0	0.2	403.0	400.0	0.4
NO ₂	0.2	0.0	0.2	5.0	0.0	0.6
NOx	0.4	0.0	0.4	408.0	400.0	1.0





NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6702005

Page: 1/1

Calibrated Date: 1-Feb-24

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Date	1-Feb-24				
Time	10:10				
Range	0.00 - 500.00 PPB	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.4	0.2	
Sample Flow	500 +/- 50	cc/min	482	494	
Ozone Flow	60-90	cc/min	74	77	
PMT Detector	0-5000	mV	51	26	
AZERO	-20-150	mV	53.3	33.3	
HVPS	400-900 constant	V	821	821	
DCPS	2500 +/- 200	mV	2556	2556	
RCCELL TEMP	50 +/- 1	Dreegee C	50	50	
BOX TEMP	20-35	Dreegee C	30.2	32.8	
PMT TEMP	7 +/- 1	Dreegee C	7.5	7.5	
IZS TEMP	50 +/- 4	Dreegee C	-	-	
MOLY Temp	315 +/- 5	Dreegee C	315.0	314.5	
RCCL PRES	4-10 contant	IN-Hg-A	8.8	8.8	
SAMP PRES	20-30 contant	IN-Hg-A	30.2	31.8	
NO Slope	1 +/- 0.3		0.820	0.822	
Nox Slope	1 +/- 0.3		0.854	0.858	
NO Offset	-10 to + 150	mV	17.8	17.8	
NOx Offset	-10 to + 150	mV	5.0	5.0	
Zero Value	NO	0	ppb	3.9	0.2
	NOx	0	ppb	5.8	0.4
Span Value	NO	400	ppb	382.0	403.0
	NOx	400	ppb	389.0	408.0

Calibrate By :



Approve By :



Date:

Sirirat Poonlak
1-Feb-24

Date:

Sarawut Keawsrinual
1-Feb-24

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Customer: BANGKOK INDUSTRIAL
GAS CO LTD
Part Number: E04NI99E15A00V3
Cylinder Number: EB0160267
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO,NO,NOX,SO2,BALN
Reference Number: 160-402685487-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Mar 31, 2023

Expiration Date: Mar 31, 2026

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	46.50 PPM	G1	+/- 1.4% NIST Traceable	03/24/2023, 03/31/2023
NITRIC OXIDE	45.00 PPM	46.50 PPM	G1	+/- 1.4% NIST Traceable	03/24/2023, 03/31/2023
SULFUR DIOXIDE	45.00 PPM	45.59 PPM	G1	+/- 1.0% NIST Traceable	03/24/2023, 03/31/2023
CARBON MONOXIDE	4500 PPM	4507 PPM	G1	+/- 1.4% NIST Traceable	03/24/2023
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	210607-22	CC708067	48.41 PPM NITRIC OXIDE/NITROGEN	+/- 1.2%	Sep 21, 2025
PRM	12395	D887660	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 22, 2022
GMIS	124206889104	CC322509	4.326 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 21, 2025
NTRM	160610-01	CC473196	49.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Mar 22, 2028
GMIS	07212022B109	EB0141209	50.08 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%	Dec 21, 2026
CO	220608	CC744768	2501.8 PPM CARBON MONOXIDE/NITROGEN	+/-0.5%	Sep 30, 2028

The SRM, NTRM, PRM, or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Mar 07, 2023
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Mar 09, 2023
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Mar 23, 2023
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Mar 16, 2023

Triad Data Available Upon Request

NOTES: Gross Weight: 27.8 Kg

Net Weight: 4.8 Kg

PO# 5223001123



[Signature]
Approved for Release





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 2 October, 2023

Certification No. 341/23

Page : 1 of 5

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : DYACON

Type : Data Logger MS-100

Serial No. : 130152 ID No. : NWSDCMS1200152

Customer : Envilab Co.,Ltd.(Head Office)
540.540/1 Soi Bangkhae 7, Bangkhae, Bangkhae
Bangkok 10160,Thailand.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1008.9 hPa

NATIONAL STANDARD WIND TUNNEL : Micromanometer Theodor Friedrichs FC014 Serial.9310119

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

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

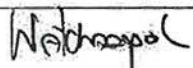
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION


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

: Thermoschneider No.918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

Calibrated by : 
Mr. Watcharapol Subwat

Mechanical Engineer

Signed : 
Mr. Pisood Promsut





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Sensor Wind Speed & Wind Direction Model WSD-1 F Certification No. 341/23

2 October, 2023

Serial No. 1226

Page : 2 of 5

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacuum inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.7	0.30
3.02	-	-	-	2.9	0.12
5.00	-	-	-	5.0	0.00
7.04	-	-	-	7.0	0.04
9.02	-	-	-	9.1	-0.08
11.01	-	-	-	11.0	0.01
13.01	-	-	-	13.1	-0.09
15.01	-	-	-	14.9	0.11
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

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

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Sensor Temperature Model TPH-1 C

Certification No. 341/23

2 October, 2023

Serial No. 6277

Page : 3 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45.2	0.0
31.1	31.2	-0.1
15.8	15.8	0.0

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Sensor Humidity Model TPH-1 C

Certification No. 341/23

2 October, 2023

Serial No. 6277

Page : 4 of 5

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
86.2	82.4	3.8
62.4	59.8	2.6
45.6	44.2	1.4

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer





Date of Issue 2 October, 2023

Certification No. 341/23

Page: 5 of 5

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING
BUCKET Product No. 7342.026 Mfg. Code. EWSDCMS1200152 ทำการสอบเทียบกับแก้ววัด
ฝนแบบแก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON
No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm/TIP)



ลงชื่อ..... ๖๕๖๖ - ๗๖-๖๖

(นายวัชรพล ทรัพย์วัฒน์)

วิศวกรชำนาญการ





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 2 October, 2023

Certification No. 337/23

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : NovaLynx

Type : Data Logger 110-WS-25DL-D

Serial No. : EWSNV110WS2508

Customer : Envilab Co.,Ltd.(Head Office)
540.540/1 Soi Bangkhae 7, Bangkhae, Bangkhae
Bangkok 10160,Thailand.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1006.5 hPa

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

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

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

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

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

: Thermoschneider No.918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

Calibrated by : Watchapol

Signed :

Mr. Watchapol Subwat

Mr. Pisood Promsut

Mechanical Engineer

(Authorised Signatory)

for the Chief

Sub-Standard Instrument



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

The Result of Calibration

Sensor model

EWSNV110WS2508

Certification No. 337/23

2 October, 2023

Page : 2 of 6

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
m/sec	inches H2O	inches H2O	m/sec	m/sec	m/sec
1.00	-	-	-	0.4	0.60
3.02	-	-	-	3.0	0.02
5.00	-	-	-	4.7	0.30
7.04	-	-	-	7.0	0.04
9.02	-	-	-	9.7	-0.68
11.01	-	-	-	11.1	-0.09
13.01	-	-	-	12.9	0.11
15.01	-	-	-	15.0	0.01
17.02	-	-	-	16.9	0.12
20.02	-	-	-	20.1	-0.08

Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	88
180	179
270	274

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

The Result of Calibration

Sensor model

EWSNV110WS2508

Certification No. 337/23

2 October, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1005.63	1005.12	0.51
1006.25	1005.85	0.40
1006.22	1005.81	0.41
1006.54	1006.00	0.54
1006.88	1006.30	0.58
1007.36	1006.80	0.56
1007.58	1007.12	0.46
1007.52	1007.13	0.39
1005.60	1005.16	0.44
1005.84	1005.41	0.43
1006.28	1005.85	0.43
1006.60	1006.18	0.42
1007.07	1006.67	0.40
1007.26	1006.86	0.40
1007.38	1006.92	0.46
1005.50	1004.98	0.52
1005.83	1005.43	0.40
1006.55	1006.17	0.38
1007.31	1006.86	0.45
1007.01	1006.64	0.37

Average

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Sensor model

EWSNV110WS2508

Certification No. 337/23

2 October, 2023

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45.4	-0.2
31.1	31.2	-0.1
15.8	15.9	-0.1

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

The Result of Calibration

Sensor model EWSNV110WS2508 Certification No. 337/23

2 October, 2023

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
86.2	81.6	4.6
62.4	59.2	3.2
45.6	42.8	2.8

Calibrated by :

Watcharapol

Mr. Watcharapol Subwat

Mechanical Engineer





Date of Issue 2 October, 2023

Certification No. 337/23

Page: 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING
BUCKET Product No. 7342.026 Mfg. Code. EWSNV110WS2508 ทำการสอบเทียบกับแก้ววัด
ฝนแบบแก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON
No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm/TIP)



ลงชื่อ.....วชิรพล ทรัพย์วัฒน์.....

(นายวชิรพล ทรัพย์วัฒน์)

วิศวกรชำนาญการ





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 2 October, 2023

Certification No. 338/23

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุณหภูมิตามวิทยา

Manufacturer : NovaLynx

Type : Data Logger 110-WS-25DL-D

Serial No. : EWSNV110WS2509

Customer : Envilab Co.,Ltd.(Head Office)
540,540/1 Soi Bangkhae 7, Bangkhae, Bangkhae
Bangkok 10160,Thailand.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1006.8 hPa

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

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

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

: Thermoschneider No.918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

Calibrated by : Watchapol

Signed :

Mr. Watchapol Subwat

Mr. Pisood Promsut

Mechanical Engineer

(Authorised Signatory)

for the Chief

Sub-Standard Instrument



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Sensor model

EWSNV110WS2509

Certification No. 338/23

2 October, 2023

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacuum inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.4	0.60
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.5	0.50
7.04	-	-	-	7.0	0.04
9.02	-	-	-	9.0	0.02
11.01	-	-	-	11.0	0.01
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.1	-0.08

Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	89
180	175
270	266

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

The Result of Calibration

Sensor model

EWSNV110WS2509

Certification No. 338/23

2 October, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1005.63	1005.12	0.51
1006.25	1005.65	0.60
1006.22	1005.72	0.50
1006.54	1006.00	0.54
1006.88	1006.30	0.58
1007.36	1006.80	0.56
1007.58	1007.04	0.54
1007.52	1007.02	0.50
1005.60	1005.02	0.58
1005.84	1005.35	0.49
1006.28	1005.72	0.56
1006.60	1006.06	0.54
1007.07	1006.54	0.53
1007.26	1006.73	0.53
1007.38	1006.86	0.52
1005.50	1004.98	0.52
1005.83	1005.34	0.49
1006.55	1006.04	0.51
1007.31	1006.86	0.45
1007.01	1006.51	0.50

Average

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Sensor model

EWSNV110WS2509

Certification No. 338/23

2 October, 2023

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45.3	-0.1
31.1	31.1	0.0
15.8	15.9	-0.1

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Sensor model EWSNV110WS2509 Certification No. 338/23

2 October, 2023

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
86.2	82.6	3.6
62.4	59.2	3.2
45.6	42.7	2.9

Calibrated by :

Watcharapol

Mr. Watcharapol Subwat

Mechanical Engineer





Date of Issue 2 October, 2023

Certification No. 338/23

Page: 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING BUCKET Product No. 7342.026 Mfg. Code. EWSNV110WS2509 ทำการสอบเทียบกับแก้ววัดฝนแบบแก้วตวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.01 in/TIP)



ลงชื่อ.....วธรรณ ทรัพย์วัฒน์.....

(นายวัชรพล ทรัพย์วัฒน์)

วิศวกรชำนาญการ





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 2 October, 2023

Certification No. 339/23

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : NovaLynx

Type : Data Logger 110-WS-25DL-D

Serial No. : EWSNV110WS2511

Customer : Envilab Co.,Ltd.(Head Office)
540.540/1 Soi Bangkhuae 7, Bangkhuae, Bangkhuae
Bangkok 10160,Thailand.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1007.1 hPa

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

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

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

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

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

: Thermoschneider No.918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. 4220015

Calibrated by : Watchapol

Signed : Mr. Pisood Promsut

Mr. Watchapol Subwat

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Sensor model

EWSNV110WS2511

Certification No. 339/23

2 October, 2023

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacuum inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.4	0.60
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.04	-	-	-	7.0	0.04
9.02	-	-	-	8.9	0.12
11.01	-	-	-	11.0	0.01
13.01	-	-	-	12.9	0.11
15.01	-	-	-	15.0	0.01
17.02	-	-	-	16.9	0.12
20.02	-	-	-	20.0	0.02

Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	91
180	179
270	

Calibrated by :

Watcharapol

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Sensor model

EWSNV110WS2511

Certification No. 339/23

2 October, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1005.63	1004.80	0.83
1006.25	1005.42	0.83
1006.22	1005.40	0.82
1006.54	1005.68	0.86
1006.88	1006.13	0.75
1007.36	1006.53	0.83
1007.58	1006.79	0.79
1007.52	1006.81	0.71
1005.60	1004.83	0.77
1005.84	1005.04	0.80
1006.28	1005.44	0.84
1006.60	1005.82	0.78
1007.07	1006.21	0.86
1007.26	1006.37	0.89
1007.38	1006.54	0.84
1005.50	1004.62	0.88
1005.83	1004.98	0.85
1006.55	1005.68	0.87
1007.31	1006.42	0.89
1007.01	1006.13	0.88

Average

0.83

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Sensor model

EWSNV110WS2511

Certification No. 339/23

2 October, 2023

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45.4	-0.2
31.1	31.0	0.1
15.8	15.9	-0.1

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

The Result of Calibration

Sensor model EWSNV110WS2511 Certification No. 339/23

2 October, 2023

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
86.2	82.1	4.1
62.4	58.5	3.9
45.6	43.8	1.8

Calibrated by :

Watcharapol

Mr. Watcharapol Subwat

Mechanical Engineer





Date of Issue 2 October, 2023

Certification No. 339/23

Page: 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING
BUCKET Product No. 7342.026 Mfg. Code. EWSNV110WS2511 ทำการสอบเทียบกับแก้ววัด
ฝนแบบแก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON
No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm/TIP)



ลงชื่อ.....

(นายวัชรพล ทรัพย์วัฒน์)

วิศวกรชำนาญการ





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 2 October, 2023

Certification No. 340/23

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : DYACON

Type : Data Logger CM-1

Serial No. : 130129 ID No. : NWSDCMS1200129

Customer : Neediss Supply Instrument Co., Ltd.
536 Soi Bangkhae 7, Bangkhae, Bangkhae,
Bangkok 10160, Thailand.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1008.7 hPa

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

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

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

: Thermoschneider No.918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

Calibrated by : *Watchapol*

Signed :

Mr. Watchapol Subwat

Mr. Pisood Pongsut

Mechanical Engineer

(Authorised Signatory)

for the Chief

Sub-Standard Instrument



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Sensor model

NWSDCMS1200129

Certification No. 340/23

2 October, 2023

Serial No. 1198

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacuum inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	2.9	0.12
5.00	-	-	-	5.0	0.00
7.04	-	-	-	6.9	0.14
9.02	-	-	-	9.0	0.02
11.01	-	-	-	11.0	0.01
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	91
180	180
270	272

Calibrated by :

Watarapol

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Sensor Pressure Model TPH-1 C

Serial No. 6235

Certification No. 340/23

2 October, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1005.63	1005.30	0.33
1006.25	1005.90	0.35
1006.22	1005.90	0.32
1006.54	1006.20	0.34
1006.88	1006.50	0.38
1007.36	1007.00	0.36
1007.58	1007.20	0.38
1007.52	1007.20	0.32
1005.60	1005.30	0.30
1005.84	1005.50	0.34
1006.28	1005.90	0.38
1006.60	1006.30	0.30
1007.07	1006.70	0.37
1007.26	1006.90	0.36
1007.38	1007.00	0.38
1005.50	1005.20	0.30
1005.83	1005.50	0.33
1006.55	1006.20	0.35
1007.31	1007.00	0.31
1007.01	1006.70	0.31

Average

0.34

Calibrated by :

Watchapol Subwat

Mr. Watchapol Subwat

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

The Result of Calibration

Sensor Temperature Model TPH-1 C

Certification No. 340/23

2 October, 2023

Serial No. 6235

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45.2	0.0
31.1	31.1	0.0
15.8	15.9	-0.1

Calibrated by :

Watcharapol

Mr. Watcharapol Subwat

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Sensor Humidity Model TPH-I C

Certification No. 340/23

2 October, 2023

Serial No. 6235

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
86.2	85.6	0.6
62.4	62.1	0.3
45.6	45.4	0.2

Calibrated by :

Watchapol

Mr. Watchapol Subwat

Mechanical Engineer





Date of Issue 2 October, 2023

Certification No. 340/23

Page: 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING
BUCKET Product No. 7342.026 Mfg. Code. NWSDCMS1200129 ทำการสอบเทียบกับแก้ววัด
ฝนแบบแก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON
No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm/TIP)



ลงชื่อ.....วิมล วรรณวิทย์.....

(นายวัชรพล ทรัพย์วัฒน์)

วิศวกรชำนาญการ





บริษัท เอ็นไวเลบ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab & Needles Supply Instrument

Verification Test Report

Report No.:

SO2400021-E002 -SLM 01

☐ PM ☒ Onsite UTM : 47P N1603922 E194661

Calibrated Date: 27 February 2024

Site : ชุมชนบ้านสระหลวง หมู่ที่ 13

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 2197

Environment: Temperature 32 °C Humidity 72 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer

Serial No.1351075

Date of Calibration : 16 March 2023

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.78	93.76	-0.02	93.78

Calibrated By:

(Kunanon Phila)

Date:

27 February 2024

Approve By:

(Wisan Ritthikamon)

Date:

27 February 2024

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Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkhoe Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evitesting.com



Envilab & Associates Supply Instrument

Verification Test Report

Report No.:

SO2400021-E002 -SLM 02

☐ PM ☒ Onsite UTM : 48P 195037 m E 1604472 m N

Calibrated Date: 27 February 2024

Site : บ้านพักพนักงาน

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 1883

Environment: Temperature 32 °C Humidity 72 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer

Serial No.1351075

Date of Calibration : 16 March 2023

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.78	93.73	-0.05	93.78

Calibrated By:

(Kunanon Phila)

Date:

27 February 2024

Approve By:

(Wisan Ritthikamon)

Date:

27 February 2024

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Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab is a member of the Supply Chain Initiative

Verification Test Report

Report No.:

SO2400021-E002 -SLM 03

☐ PM ☒ Onsite UTM : 48P 194220 m E 1605008 m N

Calibrated Date: 27 February 2024

Site : แนวรั้วของโครงการด้านทิศเหนือ

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 1914

Environment: Temperature 32 °C Humidity 72 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer

Serial No.1351075

Date of Calibration : 16 March 2023

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.78	93.75	-0.03	93.78

Calibrated By:

(Kunanon Phila)

Date:

27 February 2024

Approve By:

(Wisan Ritthikamon)

Date:

27 February 2024

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Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkhae Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab & Services 24/7 Day 02-802-3577-8

Verification Test Report

Report No.:

SO2400021-E002 -SLM 04

☐ PM ☒ Onsite UTM : 48P 194187 m E 1604868 m N

Calibrated Date: 27 February 2024

Site : แนวรั้วของโครงการด้านทิศใต้

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 2206

Environment: Temperature 32 °C Humidity 72 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer

Serial No.1351075

Date of Calibration : 16 March 2023

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.78	93.69	-0.09	93.78

Calibrated By:

(Kunanon Phila)

Date:

27 February 2024

Approve By:

(Wisan Ritthikamon)

Date:

27 February 2024

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Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



Envilab & Needles Supply Instrument

Verification Test Report

Report No.:

SO2400021-E002 -SLM 05

☐ PM ☒ Onsite UTM : 47P N1604856 E194310

Calibrated Date: 27 February 2024

Site : แนวรั้วของโครงการด้านทิศตะวันออก

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 2199

Environment: Temperature 32 °C Humidity 72 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer

Serial No.1351075

Date of Calibration : 16 March 2023

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.78	93.72	-0.06	93.78

Calibrated By:

(Kunanon Phila)

Date:

27 February 2024

Approve By:

(Wisan Ritthikamon)

Date:

27 February 2024

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Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-902-3577-9 Fax: 02-802-3773 E-mail : info@evltesting.com



Envilab & Envilab Supply Instrument

Verification Test Report

Report No.:

SO2400021-E002 -SLM 06

☐ PM

☒ Onsite UTM :

48P 194222 m E 1604915 m N

Calibrated Date: 27 February 2024

Site : แนวรั้วของโครงการด้านทิศตะวันตก

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 2205

Environment: Temperature 32 °C Humidity 72 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer

Serial No.1351075

Date of Calibration : 16 March 2023

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.78	93.71	-0.07	93.78

Calibrated By:

(Kunanon Phila)

Date:

27 February 2024

Approve By:

(Wisan Ritthikamon)

Date:

27 February 2024

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0381

MTC No. EEL. BP. 70/0366

CALIBRATION CERTIFICATE

Submitted by : Envilab Co.,Ltd.

Address : 540, 540/1 Soi Bangkhae 7, Bangkhae, Bangkhae, Bangkok 10160.

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 :

Ambient Environment

Description : Sound Level Calibrator

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

Manufacturer : Bruel & Kjaer

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

Model : 4230

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

Serial No. : 1351075

- 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 : 14 Mar. 2023

Date of Calibration : 16 Mar. 2023

1/3

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

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Office/Laboratory
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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 INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0381

MTC No. EEL. BP. 70/0366

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 1
1/2 inch Bruel&Kjaer 4180	93.78	-0.22	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	999.0	-1.0	± 1.5	$\pm 1.0\%$

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.05	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Mr. Weerachai Deechaiyae)

Approved by :

(Mr. Prawate Kluaypa)
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 16 Mar. 2023

Date of Issue : 17 Mar. 2023

Ref : 2011266031401056001

End of Certificate

2 / 2

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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Amphoe Muang, Changwat Samutprakan 10280, Thailand
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Thailand



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Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



Envilab & Needon Supply Instrument

Verification Test Report

Report No.:

SO2400021-E002 -PU 01

Calibrated Date: 3-Mar-24

Equipment: Air Sampling Pump

Manufacturer: AP BUCK

Model: LP-5

Serial or ID No. 5611

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Primary Flow Calibrator Model Defender 520 H, MESALABS

Serial No. 164578

Date of Calibration : 04 May 2023

Result of Test

Reference Flow (ml/min)	Test No.	Reading (ml/min)	Average (ml/min)
2000	1	2000.6	2000.6
	2	2000.3	
	3	2000.5	
	4	2000.7	
	5	2000.8	

Calibrated By:


(Nattawut Sardpum)

Date: 03-Mar-24

Approve By:


(Wisan Ritthikamon)

Date: 03-Mar-24

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Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkhoe Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkhoe Bangkok 10160

Verification Test Report

Report No.:

SO2400021-E002 -PU 02

Calibrated Date: 3-Mar-24

Equipment: Air Sampling Pump

Manufacturer: AP BUCK

Model: LP-5

Serial or ID No. 5612

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Primary Flow Calibrator Model Defender 520 H, MESALABS

Serial No. 164578

Date of Calibration : 04 May 2023

Result of Test


Reference Flow (ml/min)	Test No.	Reading (ml/min)	Average (ml/min)
1700	1	1700.3	1700.3
	2	1700.2	
	3	1700.8	
	4	1700.2	
	5	1700.1	

Calibrated By:


(Nattawut Sardpum)

Date: 03-Mar-24

Approve By:


(Wisan Ritthikamon)

Date: 03-Mar-24

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Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab & Needles Supply Instrument

Verification Test Report

Report No.:

SO2400021-E002 -PU 03

Calibrated Date: 3-Mar-24

Equipment: Air Sampling Pump

Manufacturer: AP BUCK

Model: LP-5

Serial or ID No. 5568

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Primary Flow Calibrator Model Defender 520 H. MESALABS

Serial No. 164578

Date of Calibration : 04 May 2023

Result of Test

Reference Flow (ml/min)	Test No.	Reading (ml/min)	Average (ml/min)
2000	1	2000.3	2000.3
	2	2000.6	
	3	2000.4	
	4	2000.1	
	5	2000.2	

Calibrated By:

(Nattawut Sardpum)

Date: 03-Mar-24

Approve By:

(Wisan Ritthikamon)

Date: 03-Mar-24

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Envilab & Needles Supply Instrument

Verification Test Report

Report No.:

SO2400021-E002 -PU 04

Calibrated Date: 3-Mar-24

Equipment: Air Sampling Pump

Manufacturer: AP BUCK

Model: LP-5

Serial or ID No. 5576

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Primary Flow Calibrator Model Defender 520 H, MESALABS

Serial No. 164578

Date of Calibration : 04 May 2023

Result of Test


Reference Flow (ml/min)	Test No.	Reading (ml/min)	Average (ml/min)
1700	1	1700.5	1700.5
	2	1700.3	
	3	1700.2	
	4	1700.6	
	5	1700.8	

Calibrated By:


(Nattawut Sardpum)

Date: 03-Mar-24

Approve By:


(Wisan Ritthikamon)

Date: 03-Mar-24

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Sampling & Flowing Supply Instruments

Verification Test Report

Report No.:

SO2400021-E002 -PU 05

Calibrated Date: 3-Mar-24

Equipment: Air Sampling Pump

Manufacturer: AP BUCK

Model: LP-5

Serial or ID No. 5821

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Primary Flow Calibrator Model Defender 520 H, MESALABS

Serial No. 164578

Date of Calibration : 04 May 2023

Result of Test

Reference Flow (ml/min)	Test No.	Reading (ml/min)	Average (ml/min)
2000	1	2000.1	2000.4
	2	2000.3	
	3	2000.8	
	4	2000.7	
	5	2000.2	

Calibrated By:

(Nattawut Sardpum)

Date: 03-Mar-24

Approve By:

(Wisan Ritthikamon)

Date: 03-Mar-24

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Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



Envilab & Needles Supply Instruments

Verification Test Report

Report No.:

SO2400021-E002 -PU 06

Calibrated Date: 3-Mar-24

Equipment: Air Sampling Pump

Manufacturer: AP BUCK

Model: LP-4

Serial or ID No. 4831

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Primary Flow Calibrator Model Defender 520 H, MESALABS

Serial No. 164578

Date of Calibration : 04 May 2023

Result of Test


Reference Flow (ml/min)	Test No.	Reading (ml/min)	Average (ml/min)
1700	1	1700.3	1700.3
	2	1700.2	
	3	1700.2	
	4	1700.5	
	5	1700.3	

Calibrated By:


(Nattawut Sardpum)

Date: 03-Mar-24

Approve By:


(Wisan Ritthikamon)

Date: 03-Mar-24

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Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab & Evltest Supply Instrument

Verification Test Report

Report No.:

SO2400021-E002 -PU 07

Calibrated Date: 3-Mar-24

Equipment: Air Sampling Pump

Manufacturer: AP BUCK

Model: LP-4

Serial or ID No. 4832

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Primary Flow Calibrator Model Defender 520 H, MESALABS

Serial No. 164578

Date of Calibration : 04 May 2023

Result of Test

Reference Flow (ml/min)	Test No.	Reading (ml/min)	Average (ml/min)
2000	1	2000.5	2000.5
	2	2000.8	
	3	2000.1	
	4	2000.9	
	5	2000.1	

Calibrated By:

(Nattawut Sardpum)

Date:

03-Mar-24

Approve By:

(Wisan Ritthikamon)

Date:

03-Mar-24

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Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab Co., Ltd. Supply Environment

Verification Test Report

Report No.:

SO2400021-E002 -PU 08

Calibrated Date: 3-Mar-24

Equipment: Air Sampling Pump

Manufacturer: AP BUCK

Model: LP-4

Serial or ID No. 4829

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Primary Flow Calibrator Model Defender 520 H, MESALABS

Serial No. 164578

Date of Calibration : 04 May 2023

Result of Test

Reference Flow (ml/min)	Test No.	Reading (ml/min)	Average (ml/min)
1700	1	1700.4	1700.4
	2	1700.9	
	3	1700.1	
	4	1700.3	
	5	1700.2	


Calibrated By:


(Nattawut Sardpum)

Date:

03-Mar-24

Approve By:


(Wisan Ritthikamon)

Date:

03-Mar-24

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Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



Envilab & Ineddit Sazly Ineddit

Verification Test Report

Report No.:

SO2400021-E002 -PU 09

Calibrated Date: 3-Mar-24

Equipment: Air Sampling Pump

Manufacturer: AP BUCK

Model: LP-4

Serial or ID No. 4830

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Primary Flow Calibrator Model Defender 520 H, MESALABS

Serial No. 164578

Date of Calibration : 04 May 2023

Result of Test

Reference Flow (ml/min)	Test No.	Reading (ml/min)	Average (ml/min)
2000	1	2000.8	2000.8
	2	2000.9	
	3	2001.1	
	4	2001.0	
	5	2000.4	

Calibrated By:

(Nattawut Sardpum)

Date:

03-Mar-24

Approve By:

(Wisan Ritthikamon)

Date:

03-Mar-24

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Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



Envilab & Related Supply Systems

Verification Test Report

Report No.:

SO2400021-E002 -PU 10

Calibrated Date: 3-Mar-24

Equipment: Air Sampling Pump

Manufacturer: AP BUCK

Model: LP-4

Serial or ID No. 4834

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Primary Flow Calibrator Model Defender 520 H, MESALABS

Serial No. 164578

Date of Calibration : 04 May 2023

Result of Test

Reference Flow (ml/min)	Test No.	Reading (ml/min)	Average (ml/min)
1700	1	1700.2	1700.5
	2	1700.3	
	3	1700.5	
	4	1700.6	
	5	1700.9	

Calibrated By:

(Nattawut Sardpum)

Date: 03-Mar-24

Approve By:

(Wisan Ritthikamon)

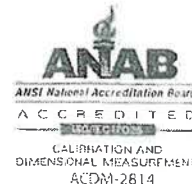
Date: 03-Mar-24

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CALIBRATION LABORATORY CO., LTD.

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



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : HEAT STRESS MONITOR
MANUFACTURER : METROSONICS
MODEL / TYPE : hs-32
SERIAL NO. : MCE030018[EHEMTHS3230018]
CLID. NO. : 232400054
JOB CONTROL NO. : 240110002416
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : ENVILAB CO., LTD.
540, 540/1 SOI BANGKHAE 7, BANGKHAE,
BANGKHAE, BANGKOK 10160 THAILAND

DATE OF RECEIVED : 10 January 2024

DATE OF ISSUED : 17 January 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Tanawan Seenam-Ngoen
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory

17 January 2024



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

Certificate No. Q24002416

F3-011-05/12-23

page 1 of 3



CALIBRATION LABORATORY Co., LTD.

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



REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	HEAT STRESS MONITOR
MANUFACTURER	:	METROSONICS
MODEL / TYPE	:	hs-32
SERIAL NO.	:	MCE030018[EHEMTHS3230018]
DATE OF CALIBRATION	:	16 January 2024

ENVIRONMENT CONDITIONS :

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

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

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPTH-11**. The calibration was performed by using Chilled Mirror Hygrometer and Temperature & Humidity Chamber which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Chilled Mirror Hygrometer, Edgetech Model Dew Master S/N. 44602.

Temperature & Humidity Chamber, PGC Model 9141-5116 S/N. 1304261.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through Thunder Scientific Corporation.
Certificate No. 21594, Due Date 06 July 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2,00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24002416

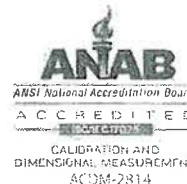
F3-011-05/12-23





CALIBRATION LABORATORY CO., LTD.

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



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring heat stress monitor.

CALIBRATION DATA

1. CORRECTION OF TEMPERATURE : WET

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty \pm (° C)
20.0	20.01	20.2	-0.19	0.40
30.0	30.00	29.8	+0.20	
40.0	39.99	39.7	+0.29	

2. CORRECTION OF TEMPERATURE : DRY

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty \pm (° C)
20.0	20.01	20.2	-0.19	0.40
30.0	30.00	29.7	+0.30	
40.0	39.99	39.6	+0.39	

3. CORRECTION OF TEMPERATURE : GLOBE

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty \pm (° C)
20.0	20.01	20.2	-0.19	0.40
30.0	30.00	29.7	+0.30	
40.0	39.99	39.6	+0.39	

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 59 of 67

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

End of Certificate

Certificate No. Q24002416

F3-011-05/12-23

page 2 of 3



CLC
Accredited
ISO/IEC 17025

CALIBRATION LABORATORY CO., LTD.

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CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : HEAT STRESS MONITOR
MANUFACTURER : QUEST TECHNOLOGIES
MODEL / TYPE : QUESTemp[®]32
SERIAL NO. : TPL040010[EHEQUQT3240010]
CLID. NO. : 232400822
JOB CONTROL NO. : 240227021073
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : ENVILAB CO., LTD.
540, 540/1 SOI BANGKHAE 7, BANGKHAE,
BANGKHAE, BANGKOK 10160 THAILAND

DATE OF RECEIVED : 27 February 2024

DATE OF ISSUED : 29 February 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Tanawan Seenam-Ngoen
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
29 February 2024



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

Certificate No. Q24021073

F3-011-05/12-23

page 1 of 3



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



REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	HEAT STRESS MONITOR
MANUFACTURER	:	QUEST TECHNOLOGIES
MODEL / TYPE	:	QUESTemp°32
SERIAL NO.	:	TPL040010[EHEQUQT3240010]
DATE OF CALIBRATION	:	28 February 2024

ENVIRONMENT CONDITIONS :

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

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

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPTH-11**. The calibration was performed by using Chilled Mirror Hygrometer which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Chilled Mirror Hygrometer, Edgetech Model Dew Master S/N. 44602.

Temperature & Humidity Chamber, PGC Model 9141-5116 S/N. 1304261.

TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Thunder Scientific Corporation.
Certificate No. 21594, Due Date 06 July 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2,00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24021073

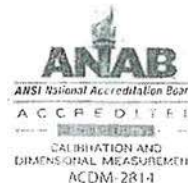
F3-011-05/12-23





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



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring heat stress monitor.

CALIBRATION DATA

1. CORRECTION OF TEMPERATURE : WET

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty \pm (° C)
20.0	20.00	19.9	+0.10	0.27
30.0	30.00	29.8	+0.20	
40.0	39.99	39.8	+0.19	

2. CORRECTION OF TEMPERATURE : DRY

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty \pm (° C)
20.0	20.00	19.9	+0.10	0.27
30.0	30.00	29.9	+0.10	
40.0	39.99	40.2	-0.21	

3. CORRECTION OF TEMPERATURE : GLOBE

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty \pm (° C)
20.0	20.00	20.0	0.00	0.27
30.0	30.00	29.8	+0.20	
40.0	39.99	39.7	+0.29	

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 59 of 67

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

End of Certificate

Certificate No. Q24021073

F3-011-05/12-23

page 3 of 3





Request No. 22-67 / 0140

MTC No. PSL-H 0032 / 67

Certificate of Calibration

Customer : Neediss Supply Instrument Co., Ltd.
536 Soi Bangkhae 7, Bangkhae, Bangkok, 10160

Item : Thermo-Hygrometer (Thermal Environment Monitor)

Model /Type : hs-32

Serial Number : MCG030002

Manufacturer : METROSONICS

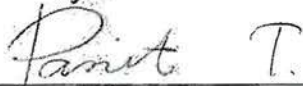
Date of Request : 9 November 2023

Date of Calibration : 27 November 2023

The certifies the above equipment was calibrated in accordance with the recognised International Standard ISO/IEC 17025:2017 and the operation according to procedure no. WI.CP.18.

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

Calibrated by :


(Ms. Panit Thummasri)

Approved by :


(Mr. Kamchai Singhapiwat)
Director

Photometry and Temperature Standards Laboratory

Ref. No : 2012266110904511004

Issued Date : 6 December 2023

Page 1 of 4

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

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FM.BL.MTC.002 Rev.4

Head Office

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Fax. (66) 0 2577 9009

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

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand

Tel. (66) 0 2323 1672-80 ext. 115, 116

Fax. (66) 0 2323 9165

E-mail : mte@tistr.or.th

Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,



Request No. 22-67 / 0140

MTC No. PSL-H 0032 / 67

Description of Unit Under Calibration :

Customer : Neediss Supply Instrument Co., Ltd.
Address : 536 Soi Bangkhae 7, Bangkhae, Bangkhae, Bangkok, 10160
Item : Thermo-Hygrometer (Thermal Environment Monitor)
Serial Number : MCG030002
Calibration Required : Temperature at (20, 30, 40) °C
Ambient Condition : Ambient temperature (23 ± 3) °C
Relative humidity (55 ± 20) %
Laboratory Address : Photometry and Temperature Standards Laboratory
Soi 1, Bangpoo Industrial Estate, Sukhumvit Rd., Samutprakan

Reference Standard :

Digital Thermometer with Sensor, Model : F250H, S/N : 9345 008 2331, Sensor RTD Probe No. RTD-01 and RTD-02 which was calibrated by Industrial Metrology and Testing Service Centre, Certificate No. PSL-T 0976/66.

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

Calibration Procedure :

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

Support Equipment :

Temperature & Humidity Controlled Chamber, Model : 9141-5110, S/N : 1205101

Adjustments : NONE



Request No. 22-67 / 0140

MTC No. PSL-H 0032 / 67

Results of Calibration :- (☒) Without Adjustment (☐) After Adjustment

Table : Temperature Measurement @ Wet Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
20.0	20.3	-0.3	0.50
30.1	30.3	-0.2	0.50
40.0	40.1	-0.1	0.50

Table : Temperature Measurement @ Dry Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
20.0	20.3	-0.3	0.50
30.1	30.3	-0.2	0.50
40.0	40.2	-0.2	0.50

Request No. 22-67 / 0140

MTC No. PSL-H 0032 / 67

Results of Calibration :-
Table : Temperature Measurement @ Globe Bulb

Average Measured Temperature (°C)	Average Displayed of UUC (°C)	Correction Measured of UUC (°C)	Expanded Uncertainty of Measurement (± °C)
20.0	20.5	-0.5	0.50
30.1	30.3	-0.2	0.50
40.0	40.1	-0.1	0.50

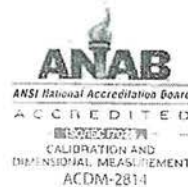
- Note :**
1. This calibration was done without removing reservoir cover, white plates and blackened copper sphere of the instrument.
 2. The calibration data for instrument in this report is reported within the condition existing at the time of measurement only.

...end of certificate...



CALIBRATION LABORATORY Co., LTD.

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



Supplement to Calibration Certificate No. Q24002408

CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : HEAT STRESS MONITOR
MANUFACTURER : QUEST TECHNOLOGIES
MODEL / TYPE : QUESTempTM32
SERIAL NO. : TPG020048[NHEQUQT3220048]
CLID. NO. : 232400066
JOB CONTROL NO. : 240110002408
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : ENVILAB CO., LTD.
540, 540/1 SOI BANGKHAE 7, BANGKHAE,
BANGKHAE, BANGKOK 10160 THAILAND

DATE OF RECEIVED : 10 January 2024

DATE OF ISSUED : 06 February 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Tanawan Seenam-Ngoen
Calibration Engineer

Approved By :

Mongkol Yotsoontorn
Authorized Signatory
06 February 2024



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

Certificate No. Q24002408A1

F3-012-05/12-23



CALIBRATION LABORATORY Co., LTD.

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



REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	HEAT STRESS MONITOR
MANUFACTURER	:	QUEST TECHNOLOGIES
MODEL / TYPE	:	QUESTemp ^{OTM} 32
SERIAL NO.	:	TPG020048[NHEQUQT3220048]
DATE OF CALIBRATION	:	16 January 2024

ENVIRONMENT CONDITIONS :

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

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

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPTH-11**. The calibration was performed by using Chilled Mirror Hygrometer and Temperature & Humidity Chamber which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Chilled Mirror Hygrometer, Edgetech Model Dew Master S/N. 44602.

Temperature & Humidity Chamber, PGC Model 9141-5116 S/N. 1304261.

TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Thunder Scientific Corporation.

Certificate No. 21594, Due Date 06 July 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.

It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24002408

F3-011-05/12-23





CLC
Accredited
ISO/IEC 17025

CALIBRATION LABORATORY CO., LTD.

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



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring heat stress monitor.

CALIBRATION DATA

1. CORRECTION OF TEMPERATURE : WET

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty \pm (° C)
20.0	20.01	19.8	+0.21	0.40
30.0	30.00	29.9	+0.10	
40.0	39.99	40.0	-0.01	

2. CORRECTION OF TEMPERATURE : DRY

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty \pm (° C)
20.0	20.01	19.9	+0.11	0.42
30.0	30.00	29.9	+0.10	
40.0	39.99	40.0	-0.01	

3. CORRECTION OF TEMPERATURE : GLOBE

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty \pm (° C)
20.0	20.01	19.9	+0.11	0.40
30.0	30.00	30.1	-0.10	
40.0	39.99	40.2	-0.21	

Notc. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 59 of 67

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

End of Certificate

Certificate No. Q24002408

F3-011-05/12-23





CALIBRATION LABORATORY CO., LTD.

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



Supplement to Calibration Certificate No. Q24002401

CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE : HEAT STRESS MONITOR
MANUFACTURER : QUEST TECHNOLOGIES
MODEL / TYPE : QUESTemp^o32
SERIAL NO. : TPD010029[NHEQUQT3210029]
CLID. NO. : 232400055
JOB CONTROL NO. : 240110002401
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : ENVILAB CO., LTD.
540, 540/1 SOI BANGKHAE 7, BANGKHAE,
BANGKHAE, BANGKOK 10160 THAILAND

DATE OF RECEIVED : 10 January 2024

DATE OF ISSUED : 06 February 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By : Tanawan Seenam-Ngoen
Calibration Engineer

Approved By : Mongkol Yotsoontorn
Authorized Signatory
06 February 2024



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

Certificate No. Q24002401A1
F3-012-05/12-23



CALIBRATION LABORATORY Co., LTD.

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



REPORT OF CALIBRATION

FOR

NOMENCLATURE	:	HEAT STRESS MONITOR
MANUFACTURER	:	QUEST TECHNOLOGIES
MODEL / TYPE	:	QUESTemp ^o 32
SERIAL NO.	:	TPD010029[NHEQUQT3210029]
DATE OF CALIBRATION	:	16 January 2024

ENVIRONMENT CONDITIONS :

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

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

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPTH-11**. The calibration was performed by using Chilled Mirror Hygrometer and Temperature & Humidity Chamber which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Chilled Mirror Hygrometer, Edgetech Model Dew Master S/N. 44602.

Temperature & Humidity Chamber, PGC Model 9141-5116 S/N. 1304261.

TRACEABILITY :

The measurements are traceable to International System of Units (SI) , through Thunder Scientific Corporation.
Certificate No. 21594, Due Date 06 July 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2,00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24002401

F3-011-05/12-23





CALIBRATION LABORATORY CO., LTD.

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



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties of the measuring heat stress monitor.

CALIBRATION DATA

1. CORRECTION OF TEMPERATURE : WET

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty \pm (° C)
20.0	20.01	20.1	-0.09	0.40
30.0	30.00	29.9	+0.10	
40.0	39.99	39.8	+0.19	

2. CORRECTION OF TEMPERATURE : DRY

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty \pm (° C)
20.0	20.01	20.0	+0.01	0.40
30.0	30.00	29.9	+0.10	
40.0	39.99	39.8	+0.19	

3. CORRECTION OF TEMPERATURE : GLOBE

Test point (° C)	Actual Temperature (° C)	DUC Reading (° C)	Correction (° C)	Uncertainty \pm (° C)
20.0	20.01	20.1	-0.09	0.40
30.0	30.00	30.0	0.00	
40.0	39.99	39.8	+0.19	

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 59 of 67

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

End of Certificate

Certificate No. Q24002401

F3-011-05/12-23





บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



Envilab & Needless Safety Instrument

Verification Test Report

Report No.:

SO2400021-E002 -SLM 01

☒ PM ☐ Onsite UTM : 47P 1514458 654247

Calibrated Date: 26 February 2024

Site : บริษัท เอ็นไวแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 1879

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer

Serial No.1351075

Date of Calibration : 16 March 2023

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.78	93.75	-0.03	93.78

Calibrated By:

(Nattawut Sardpum)

Date:

26 February 2024

Approve By:

(Wisan Ritthikamon)

Date:

26 February 2024

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บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkhoe Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab & Envilab Signify Instrument

Verification Test Report

Report No.:

SO2400021-E002 -SLM 02

☒ PM ☐ Onsite UTM : 47P 1514458 654247

Calibrated Date: 26 February 2024

Site : บริษัท เอ็นไวแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 1881

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer


Serial No.1351075

Date of Calibration : 16 March 2023

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.78	93.76	-0.02	93.78


Calibrated By:


(Nattawut Sardpum)

Date:

26 February 2024

Approve By:


(Wisan Ritthikamon)

Date:

26 February 2024

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บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhae 7 Bangkhae Bangkhae Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab & Headlab Supply Instrument

Verification Test Report

Report No.:

SO2400021-E002 -SLM 03

☒ PM ☐ Onsite UTM : 47P 1514458 654247

Calibrated Date: 26 February 2024

Site : บริษัท เอ็นไวแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 1805

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer

Serial No.1351075

Date of Calibration : 16 March 2023

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.78	93.76	-0.02	93.78

Calibrated By:

(Nattawut Sardpum)

Date:

26 February 2024

Approve By:

(Wisan Ritthikamon)

Date:

26 February 2024

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Envilab Co., Ltd. S40,540/1 Soi Bangkhae 7 Bangkhae Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax: 02-802-3773 E-mail : info@evltesting.com



Envilab S. Needles Supply Instrument

Verification Test Report

Report No.:

SO2400021-E002 -SLM 04

☒ PM ☐ Onsite UTM : 47P 1514458 654247

Calibrated Date: 26 February 2024

Site : บริษัท เอ็นไวแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 1807

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer

Serial No.1351075

Date of Calibration : 16 March 2023

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.78	93.75	-0.03	93.78


Calibrated By:


(Nattawut Sardpum)

Date:

26 February 2024

Approve By:


(Wisan Ritthikamon)

Date:

26 February 2024

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Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkok Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evitestng.com



Envilab Co., Ltd. is a ISO 9001:2015 certified company

Verification Test Report

Report No.:

SO2400021-E002 -SLM 05

☒ PM ☐ Onsite UTM : 47P 1514458 654247

Calibrated Date: 26 February 2024

Site : บริษัท เอ็นไวแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 1796

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer

Serial No.1351075

Date of Calibration : 16 March 2023

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.78	93.77	-0.01	93.78

Calibrated By:

(Nattawut Sardpum)

Date:

26 February 2024

Approve By:

(Wisan Ritthikamon)

Date:

26 February 2024

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บริษัท เอ็นไวแล็บ จำกัด 540,540/1 ซอยบางแค 7 แขวงบางแค เขตบางแค กรุงเทพฯ 10160
Envilab Co., Ltd. 540,540/1 Soi Bangkhoe 7 Bangkhoe Bangkhoe Bangkok 10160
Tel : 02-802-3577-8 Fax. 02-802-3773 E-mail : info@evltesting.com



Envilab 5 Accredited Supply Instrument

Verification Test Report

Report No.:

SO2400021-E002 -SLM 06

☒ PM

☐ Onsite UTM :

47P 1514458 654247

Calibrated Date: 26 February 2024

Site : บริษัท เอ็นไวแล็บ จำกัด

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 1812

Environment: Temperature 25 °C Humidity 60 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&Kjaer

Serial No.1351075

Date of Calibration : 16 March 2023

Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.78	93.73	-0.05	93.78

Calibrated By:

(Nattawut Sardpum)

Date:

26 February 2024

Approve By:

(Wisan Ritthikamon)

Date:

26 February 2024

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