

ภาคผนวกที่ 4

สรุปเอกสารสอบเทียบอุปกรณ์เครื่องมือ

เอกสารการสอบเทียบเครื่องมือตรวจวัดระดับเสียงในบรรยากาศ

CERTIFICATE OF CALIBRATION

Certificate No. : 66S0330-1 Job No. : 66S0330 Page : 1 of 2

Customer : C.E.M Technology (Thailand) Co.,Ltd.

Address : 31/9 Moo 13, Raikhing, Samphran,
Nakhornpathom 73210

Location : Laboratory

Equipment : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial No. : 222196

Identity No. : NS-03-026

Range : See to Data

Ambient temperature : (20 ± 2) °C

Relative humidity : (50 ± 15) %

Atmospheric pressure : -

Date of received : 08-Mar-2023

Date of calibration : 10-Mar-2023

Date of issued : 13-Mar-2023

Calibration Method : This instrument was calibrated by comparison measurement with sound level calibrator, according to in house calibration method.

Reference Standard Instruments :

Equipment	Model	Serial No.	Certification No.	Due Date
Sound Level Calibrator	8930B	2000210	EEL.BP.31/0664	15-Jun-2023

Traceability : This certification is traceable to the International System of Unit maintained at : -
- National Institute of Metrology Thailand, (NIMT).

Calibrated By : Mr. Boonyarit Auejirakarn

Approved By :

☐ Ms. Bhacharin Phanangkaew (MD)

☒ Mr. Boonyarit Auejirakarn

Reviewed By : ☐ Mr. Sompong Srisert

☒ Ms. Natthaparakarn Thammaphan

The reported expanded uncertainty is based uncertainty multiplied by a coverage factor k = 2, providing a level of confidence approximately 95%
This result relates only to the item calibrated. The certificate shall not be reproduced except in full, without the written approval of the calibration director.

Result of Calibration : Without Adjustment

Function : Sound Level Measurement

Calibration Range : @ 1 kHz

Resolution : 0.1 dB / 1 dB

Response	Standard Setting (dB)	UUC Reading (dB)	Error Value (dB)	Uncertainty (+/- dB)
A	94	94.1	0.1	0.20
	104	103.8	-0.2	0.20
	114	113.6	-0.4	0.20
C	94	94.0	0.0	0.20
	104	103.8	-0.2	0.20
	114	113.7	-0.3	0.20
Z	94	94.0	0.0	0.20
	104	103.8	-0.2	0.20
	114	113.6	-0.4	0.20

UUC* = Unit Under Calibration

- The End -

CERTIFICATE OF CALIBRATION

Certificate No. : 66S0330-2 Job No. : 66S0330 Page : 1 of 2

Customer : C.E.M Technology (Thailand) Co.,Ltd.

Address : 31/9 Moo 13, Raikhing, Samphran,
Nakhornpathom 73210

Location : Laboratory

Equipment : Sound Level Meter

Ambient temperature : (20 ± 2) °C

Manufacturer : ACO

Relative humidity : (50 ± 15) %

Model : 6236

Atmospheric pressure : -

Serial No. : 222199

Date of received : 08-Mar-2023

Identity No. : NS-03-029

Date of calibration : 10-Mar-2023

Range : See to Data

Date of issued : 13-Mar-2023

Calibration Method : This instrument was calibrated by comparison measurement with sound level calibrator, according to in house calibration method.

Reference Standard Instruments :

Equipment	Model	Serial No.	Certification No.	Due Date
Sound Level Calibrator	8930B	2000210	EEL.BP.31/0664	15-Jun-2023

Traceability : This certification is traceable to the International System of Unit maintained at :
- National Institute of Metrology Thailand, (NIMT).

Calibrated By : Mr. Boonyarit Auejirakarn

Approved By :

☐ Ms. Bhacharin Phanangkaew (MD)

☒ Mr. Boonyarit Auejirakarn

Reviewed By : ☐ Mr. Sompong Srisert

☒ Ms. Natthaparakarn Thammaphan

The reported expanded uncertainty is based uncertainty multiplied by a coverage factor k = 2, providing a level of confidence approximately 95%
This result relates only to the item calibrated. The certificate shall not be reproduced except in full, without the written approval of the calibration director.

Result of Calibration : Without Adjustment

Function : Sound Level Measurement

Calibration Range : @ 1 kHz

Resolution : 0.1 dB / 1 dB

Response	Standard Setting (dB)	UUC Reading (dB)	Error Value (dB)	Uncertainty (+/-dB)
A	94	94.2	0.2	0.20
	104	104.2	0.2	0.20
	114	114.2	0.2	0.20
C	94	94.1	0.1	0.20
	104	104.2	0.2	0.20
	114	114.2	0.2	0.20
Z	94	94.2	0.2	0.20
	104	104.2	0.2	0.20
	114	114.1	0.1	0.20

UUC* = Unit Under Calibration

- The End -

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30064

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER

MANUFACTURER : ACO

MODEL : TYPE 6226

SERIAL No. : 090057

ID No. : CEM-SI-02

SUBMITTED BY : C.E.M TECHNOLOGY (THAILAND) CO.,LTD.
219/43 MOO 12, PETCHKASEM RD., OMNOI,
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY : 
CALIBRATION DATE : 9-May-23

APPROVED BY : 
PHUDIT P.

ISSUED DATE : 9-May-23

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30064

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : SOUND LEVEL METER

MANUFACTURER : ACO

MODEL : TYPE 6226 **SERIAL NUMBER** : 090057

ID No. : CEM-SI-02

RECEIVED DATE : 4-May-23 **CALIBRATION DATE** : 9-May-23

AMBIENT TEMPERATURE : 22 °C ± 3 °C **RELATIVE HUMIDITY** : 50%RH ± 20%RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IEC 61672-2:2003-04 AGAINST MULTIFUNCTION SOUND CALIBRATOR.
THIS INSTRUMENT WAS PERFORMED SELF-CALIBRATION BY CALIBRATOR FROM CUSTOMER AT 114 Hz BEFORE CALIBRATION.
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No.	CERTIFICATL E No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR.	1986	01827	EEL.BP.55/0974	12-Jan-24

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO :-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH THAILAND INSTITUTE OF SCIENTIFIC AND
TECHNOLOGICAL RESEARCH (TISTR).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. A-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-16.10	-15.80	-0.30	0.50
250.00	-8.60	-8.10	-0.50	0.50
500.00	-3.20	-3.0	-0.20	0.50
1000.00	0.00	0.00	0.0	0.50
2000.00	1.20	0.90	0.3	0.50

2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-0.20	0.1	-0.3	0.50
250.00	0.00	0.5	-0.5	0.50
500.00	0.00	0.3	-0.3	0.50
1000.00	0.00	0.0	0.0	0.50
2000.00	-0.20	-0.4	0.2	0.50

3. SOUND LEVEL LINEARITY TEST AT 1000 Hz

STANDARD APPLIED (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
74	74.0	0.0	0.50
84	84.0	0.0	0.50
94	94.0	0.0	0.50
104	104.1	-0.1	0.50
114	114.2	-0.2	0.50

UUC* : UNIT UNDER CALIBRATION
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY
A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%

END OF CALIBRATION REPORT

THIS CERTIFICATE MAY NOT BE REPRODUCED OTHER THAN IN FULL EXCEPT WITH THE PRIOR WRITTEN APPROVAL OF

G.RUAMKIT PANICH CO.,LTD.

Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER

MANUFACTURER : ACO

MODEL : TYPE 6226

SERIAL No. : 150007

ID No. : CEM-SI-07

SUBMITTED BY : C.E.M TECHNOLOGY (THAILAND) CO.,LTD.
219/43 MOO 12, PETCHKASEM RD., OMNOI,
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY : 
SURAWIT K.

CALIBRATION DATE : 9-May-23

APPROVED BY : 
PHUDIT P.

ISSUED DATE : 9-May-23

Calibration Report

EQUIPMENT : SOUND LEVEL METER

MANUFACTURER : ACO

MODEL : TYPE 6226 SERIAL NUMBER : 150007

ID No. : CEM-SI-07

RECEIVED DATE : 4-May-23 CALIBRATION DATE : 9-May-23

AMBIENT TEMPERATURE : 22 °C ± 3°C RELATIVE HUMIDITY : 50%RH ± 20%RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IEC 61672-2:2003-04 AGAINST MULTIFUNCTION SOUND CALIBRATOR.
THIS INSTRUMENT WAS PERFORMED SELF-CALIBRATION BY CALIBRATOR FROM CUSTOMER AT 114 Hz BEFORE CALIBRATION.
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No.	CERTIFICATL No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR.	1986	01827	EEL.BP.55/0974	12-Jan-24

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO :-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH THAILAND INSTITUTE OF SCIENTIFIC AND
TECHNOLOGICAL RESEARCH (TISTR).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT**1. A-WEIGHTING ACOUSTIC FREQUENCY RESPONSE**

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-16.10	-15.80	-0.30	0.50
250.00	-8.60	-8.10	-0.50	0.50
500.00	-3.20	-3.0	-0.20	0.50
1000.00	0.00	0.00	0.0	0.50
2000.00	1.20	0.90	0.3	0.50

2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-0.20	0.1	-0.3	0.50
250.00	0.00	0.5	-0.5	0.50
500.00	0.00	0.3	-0.3	0.50
1000.00	0.00	0.0	0.0	0.50
2000.00	-0.20	-0.4	0.2	0.50

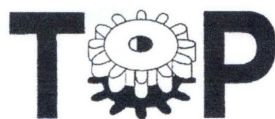
3. SOUND LEVEL LINEARITY TEST AT 1000 Hz

STANDARD APPLIED (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
74	74.0	0.0	0.50
84	84.0	0.0	0.50
94	94.0	0.0	0.50
104	104.1	-0.1	0.50
114	114.2	-0.2	0.50

UUC* : UNIT UNDER CALIBRATION
THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY
A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%

END OF CALIBRATION REPORT

เอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพอากาศในบรรยากาศ



Trade & Engineering

TSP High Volume Sampler TE-5000 TSP Sampler Verification

Site Information

Location: - Site ID: - Date: 9 Jan 23
Sampler: TE-5000 TSP Serial No: 3262 Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 29.00 Corrected Pressure (mm Hg): 736.6
Temperature (deg F): 76.0 Temperature (deg K): 297.6
Average Press. (in Hg): 27.00 Corrected Average (mm Hg): 685.8
Average Temp (Deg F): 75.8 Average Temp (Deg K): 297.5

Calibration Orifice

Make: Tisch Qstd Slope: 1.58304
Model: TE-5028A Qstd Intercept: -0.01520
Serial#: 1179 Calibration Due Date 12 December 2023

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	8.20	1.792	62.0	61.08	Slope: 37.2576
2	6.40	1.584	55.0	54.18	Intercept: -5.2773
3	5.00	1.401	48.0	47.29	Corr. Coeff: 0.9987
4	4.50	1.330	45.0	44.33	
5	3.90	1.239	41.0	40.39	

of Observations: 5

Calculations

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

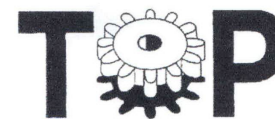
Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:
 $1/m((I)[\text{Sqrt}(298/Tav)(Pav/760)]-b)$

nter Average I (chart): 44.0
Average Flow Calculation m3/min
1.264452021
Average Flow Calculation in cfm
44.64872898
Sample Time (Hrs): 24.0
Total flow in 24 hours m3/min
1820.810911
Total flow in 24 hours cfm
64294.16973

NOTE: Ensure calibration orifice has been certified within 12 months of use



Trade & Engineering

TSP High Volume Sampler TE-5000 TSP Sampler Verification

Site Information

Location: - Site ID: - Date: 9 Jan 23
Sampler: TE-5000 TSP Serial No: 3266 Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 28.00 Corrected Pressure (mm Hg): 711.2
Temperature (deg F): 76.0 Temperature (deg K): 297.6
Average Press. (in Hg): 27.00 Corrected Average (mm Hg): 685.8
Average Temp (Deg F): 75.3 Average Temp (Deg K): 297.2

Calibration Orifice

Make: Tisch Qstd Slope: 1.58304
Model: TE-5028A Qstd Intercept: -0.01520
Serial#: 1179 Calibration Due Date 12 December 2023

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	8.20	1.761	63.6	61.57	Slope: 38.1692
2	6.40	1.557	56.9	55.08	Intercept: -5.0169
3	5.00	1.377	49.7	48.11	Corr. Coeff: 0.9967
4	4.50	1.307	46.5	45.01	
5	3.90	1.217	42.0	40.66	

of Observations: 5

Calculations

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

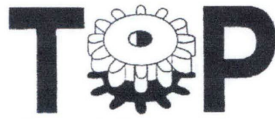
Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:
 $1/m((I)[\text{Sqrt}(298/Tav)(Pav/760)]-b)$

nter Average I (chart): 44.0
Average Flow Calculation m3/min
1.22794512
Average Flow Calculation in cfm
43.35964351
Sample Time (Hrs): 24.0
Total flow in 24 hours m3/min
1768.240973
Total flow in 24 hours cfm
62437.88665

NOTE: Ensure calibration orifice has been certified within 12 months of use



Trade & Engineering

TSP High Volume Sampler TE-5000 TSP Sampler Verification

Site Information

Location: - Site ID: - Date: 19 Oct 22
Sampler: TE-5000 TSP Serial No: 3281 Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 31.00 Corrected Pressure (mm Hg): 787.4
Temperature (deg F): 76.0 Temperature (deg K): 297.6
Average Press. (in Hg): 28.00 Corrected Average (mm Hg): 711.2
Average Temp (Deg F): 75.9 Average Temp (Deg K): 297.5

Calibration Orifice

Make: Tisch Qstd Slope: 1.58304
Model: TE-5028A Qstd Intercept: -0.01520
Serial#: 1179 Calibration Due Date 12 December 2023

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	8.30	1.863	63.0	64.17	Slope: 37.5798
2	6.50	1.650	56.0	57.04	Intercept: -5.4367
3	5.10	1.463	49.0	49.91	Corr. Coeff: 0.9986
4	4.60	1.390	46.0	46.85	
5	4.00	1.296	42.0	42.78	

of Observations: 5

Calculations

$$Qstd = 1/m[\sqrt{(H2O(Pa/Pstd)(Tstd/Ta))}] - b]$$

$$IC = I[\sqrt{(Pa/Pstd)(Tstd/Ta)}]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$$1/m((I)[\sqrt{(298/Tav)(Pav/760)}] - b)$$

m = sampler slope

b = sampler intercept

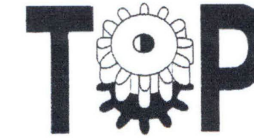
I = chart response

Tav = daily average temperature

Pav = daily average pressure

Enter Average I (chart): 43.0
Average Flow Calculation m3/min
1.252415345
Average Flow Calculation in cfm
44.2237051
Sample Time (Hrs): 24.0
Total flow in 24 hours m3/min
1803.478097
Total flow in 24 hours cfm
63682.13534

NOTE: Ensure calibration orifice has been certified within 12 months of use



Trade & Engineering

PM10 High Volume Sampler Verification

Site Information

Location: - Site ID: - Date: 10 January 2023
Sampler: TE-6070 PM10 Serial No: 1629 Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 29.00 Corrected Pressure (mm Hg): 736.6
Temperature (deg F): 76.0 Temperature (deg K): 297.4
Average Press. (in Hg): 28.50 Corrected Average (mm Hg): 723.9
Average Temp. (deg F): 75.6 Average Temp. (deg K): 297.2

Calibration Orifice

Make: Tisch Environmental, Inc. Qstd Slope: 1.58304
Model: TE-5028A Qstd Intercept: -0.01520
Serial#: 1179 Calibration Due Date: 12 Dec 23

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	8.10	1.152	59.2	37.62	Slope 31.6154
2	6.30	1.017	54.2	34.44	Intercept 1.7368
3	5.10	0.916	49.2	31.26	Corr. Coeff 0.9952
4	4.30	0.842	44.1	28.02	SFR 1.111
5	3.10	0.716	38.0	24.15	SSP 58.03

of Observations: 5

Calculations

$$Qa = 1/m[\sqrt{(H2O)(Ta/Pa))}] - b]$$

$$IC = I[\sqrt{(Ta/Pa)}]$$

Qa = actual flow rate

IC = corrected chart response

m = calibrator slope

b = calibrator intercept

Ta = actual temperature (deg K)

Pa = actual pressure (mm Hg)

For subsequent calculation

of sampler flow:

$$SFR = 1.13(Ps/Pa)(Ta/Ts)$$

$$SSP = (m*SFR + b)/(\sqrt{(Pa/Ta)})$$

SFR = sampler set point flow rate

SSP = sampler chart set point

m = sampler slope

b = sampler intercept

Ta = actual temperature (deg K)

Pa = actual pressure (mm Hg)

Ts = Average temperature (deg K)

Ps = Average pressure (mm Hg)

m = sampler slope

b = sampler intercept

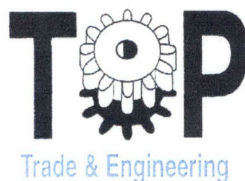
I = chart response

Tav = daily average temperature

Pav = daily average pressure

Average I (chart): 56.9
Average Flow over Sample (m3/min)
1.098289496
Enter Total Time (Hrs): 24.0
Total flow over sample (m3/min)
1581.536874
Total flow over sample (CFM)
55844.06701

NOTE: Ensure calibration orifice has been certified within 12 months of use



PM10 High Volume Sampler Verification

Site Information

Location: - Site ID: - Date: 10 January 2023
Sampler: TE-6070 PM10 Serial No: 3260 Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 27.00 Corrected Pressure (mm Hg): 685.8
Temperature (deg F): 75.5 Temperature (deg K): 297.2
Average Press. (in Hg): 26.40 Corrected Average (mm Hg): 670.6
Average Temp. (deg F): 75.0 Average Temp. (deg K): 296.9

Calibration Orifice

Make: Tisch Environmental, Inc. Qstd Slope: 1.58304
Model: TE-5028A Qstd Intercept: -0.01520
Serial#: 1179 Calibration Due Date: 12 Dec 23

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	8.10	1.193	59.2	38.97	Slope 31.6154
2	6.30	1.053	54.2	35.68	Intercept 1.8101
3	5.10	0.949	49.2	32.39	Corr. Coeff 0.9952
4	4.30	0.872	44.1	29.03	SFR 1.106
5	3.10	0.742	38.0	25.01	SSP 55.87
# of Observations:					5

Calculations

$$Qa = 1/m(\sqrt{(H2O)(Ta/Pa)})-b$$
$$IC = I(\sqrt{(Ta/Pa)})$$

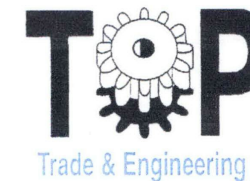
Qa = actual flow rate
IC = corrected chart response
m = calibrator slope
b = calibrator intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
For subsequent calculation
of sampler flow:

SFR = $1.13(Ps/Pa)(Ta/Ts)$
SSP = $(m*SFR+b)(\sqrt{(Pa/Ta)})$
SFR = sampler set point flow rate
SSP = sampler chart set point
m = sampler slope
b = sampler intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
Ts = Average temperature (deg K)
Ps = Average pressure (mm Hg)

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

Average I(chart): 53.1
Average Flow over Sample (m3/min)
1.060313912
Enter Total Time (Hrs): 24.0
Total flow over sample (m3/min)
1526.852034
Total flow over sample (CFM)
53913.14532

NOTE: Ensure calibration orifice has been certified within 12 months of use



PM10 High Volume Sampler Verification

Site Information

Location: - Site ID: - Date: 4 October 2022
Sampler: TE-6070 PM10 Serial No: 3286 Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 27.00 Corrected Pressure (mm Hg): 760.1
Temperature (deg F): 77.6 Temperature (deg K): 298.3
Average Press. (in Hg): 30.00 Corrected Average (mm Hg): 761.2
Average Temp. (deg F): 77.9 Average Temp. (deg K): 298.5

Calibration Orifice

Make: Tisch Environmental, Inc. Qstd Slope: 1.58304
Model: TE-5028A Qstd Intercept: -0.01520
Serial#: 1179 Calibration Due Date: 12 Dec 23

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	7.50	1.093	56.0	35.08	Slope 31.5206
2	5.90	0.971	51.0	31.95	Intercept 0.9099
3	4.60	0.858	45.0	28.19	Corr. Coeff 0.9973
4	3.80	0.781	40.0	25.06	SFR 1.131
5	2.90	0.684	36.0	22.55	SSP 58.36
# of Observations:					5

Calculations

$$Qa = 1/m(\sqrt{(H2O)(Ta/Pa)})-b$$
$$IC = I(\sqrt{(Ta/Pa)})$$

Qa = actual flow rate
IC = corrected chart response
m = calibrator slope
b = calibrator intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
For subsequent calculation
of sampler flow:

SFR = $1.13(Ps/Pa)(Ta/Ts)$
SSP = $(m*SFR+b)(\sqrt{(Pa/Ta)})$
SFR = sampler set point flow rate
SSP = sampler chart set point
m = sampler slope
b = sampler intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
Ts = Average temperature (deg K)
Ps = Average pressure (mm Hg)

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

Average I(chart): 55.4
Average Flow over Sample (m3/min)
1.071752758
Enter Total Time (Hrs): 24.0
Total flow over sample (m3/min)
1543.323972
Total flow over sample (CFM)
54494.76945

NOTE: Ensure calibration orifice has been certified within 12 months of use

Certificate of Analyzer Performance Testing

Calibrated Date : 22-Jul-23 Certificate No. : 0723-001
Page : 1/1

Analyzer Instruments

Analyzer Type : CO Analyzer Manufacturer : Thermo Environmental
Model : 48C Serial No. : 508011061

Environmental

Temperature : 24.2 °C
Humidity : 52.0 %RH

Calibration System

Calibrator Units

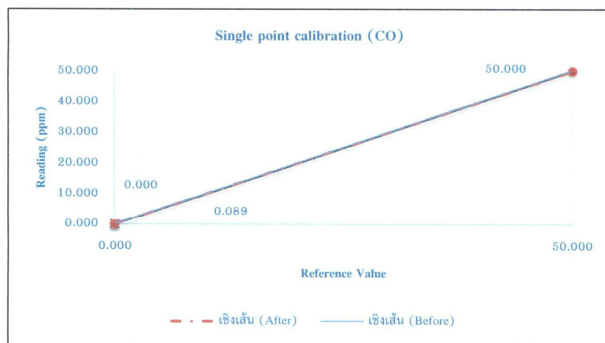
Gas Calibration : Thermo Environmental Zero Air Generator : API
Model : 146C Model : 701
Serial No. : 514811458 Serial No. : 179

Standard Gas

NO Conc. : 2 ppm Cylinder No. : CC750227
SO2 Conc. : 2 ppm Expire Date : 21-Nov-23
CO Conc. : 50 ppm

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
CO	0.089	0.000	0.09	50.2	50.000	0.40
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



Calibrated by :

Tong Piima
(Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 26-Aug-23 Certificate No. : 0823-006
Page : 1/1

Analyzer Instruments

Analyzer Type : CO Analyzer Manufacturer : Thermo Environmental
Model : 48C Serial No. : 508011064

Environmental

Temperature : 24.9 °C
Humidity : 41.3 %RH

Calibration System

Calibrator Units

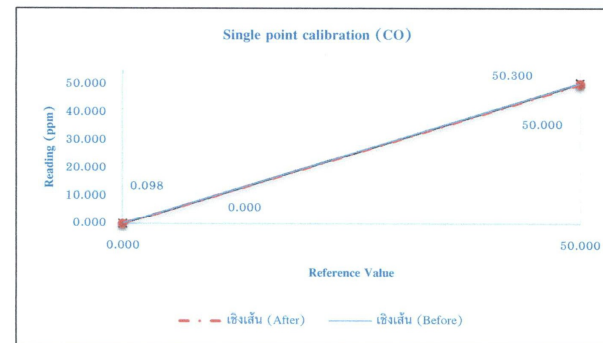
Gas Calibration : Thermo Environmental Zero Air Generator : API
Model : 146C Model : 701
Serial No. : 514811458 Serial No. : 179

Standard Gas

NO Conc. : 2 ppm Cylinder No. : CC750227
SO2 Conc. : 2 ppm Expire Date : 21-Nov-23
CO Conc. : 50 ppm

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
CO	0.098	0.000	0.10	50.3	50.000	0.60
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



Calibrated by :

Tong Piima
(Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 21-Jan-23 Certificate No. : 0123-003
Page : 1/1

Analyzer Instruments

Analyzer Type : CO Analyzer Manufacturer : Thermo Environmental
Model : 48C Serial No. : 71021-367

Environmental

Temperature : 26.4 °C
Humidity : 52.7 %RH

Calibration System

Calibrator Units

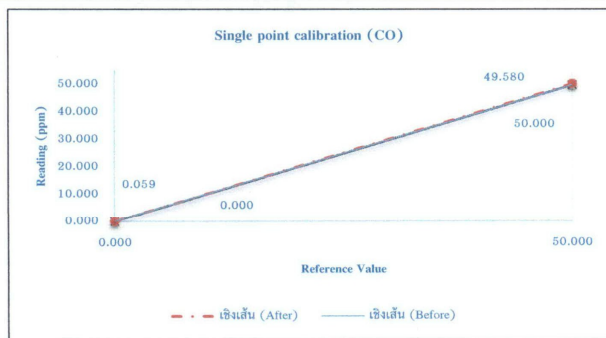
Gas Calibration : Thermo Environmental Zero Air Generator : API
Model : 146C Model : 701
Serial No. : 514811458 Serial No. : 179

Standard Gas

NO Conc. : 2 ppm Cylinder No. : CC750227
SO2 Conc. : 2 ppm Expire Date : 21-Nov-23
CO Conc. : 50 ppm

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
CO	0.059	0.000	0.06	49.580	50.000	-0.84
After						
CO	0.000	0.000	0.00	50.000	50.000	0.00



Calibrated by :

Tong Piima
(Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 5-Aug-23 Certificate No. : 0823-001
Page : 1/1

Analyzer Instruments

Analyzer Type : SO2 Analyzer Manufacturer : Thermo Environmental
Model : 43C Serial No. : 43C-62201-334

Environmental

Temperature : 25.0 °C
Humidity : 51.9 %RH

Calibration System

Calibrator Units

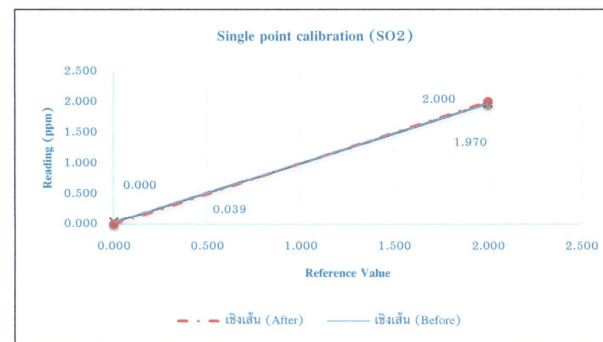
Gas Calibration : Thermo Environmental Zero Air Generator : API
Model : 146C Model : 701
Serial No. : 514811458 Serial No. : 179

Standard Gas

NO Conc. : 2 ppm Cylinder No. : CC750227
SO2 Conc. : 2 ppm Expire Date : 21-Nov-23
CO Conc. : 50 ppm

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
SO2	0.039	0.000	0.04	1.97	2.000	-1.50
After						
SO2	0.000	0.000	0.00	2.00	2.000	0.00



Calibrated by :

Tong Piima
(Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 26-Aug-23 Certificate No. : 0823-004
Page : 1/1

Analyzer Instruments

Analyzer Type : SO2 Analyzer Manufacturer : Thermo Environmental
Model : 43C Serial No. : 43C-77419-385

Environmental

Temperature : 25.1 °C
Humidity : 46.2 %RH

Calibration System

Calibrator Units

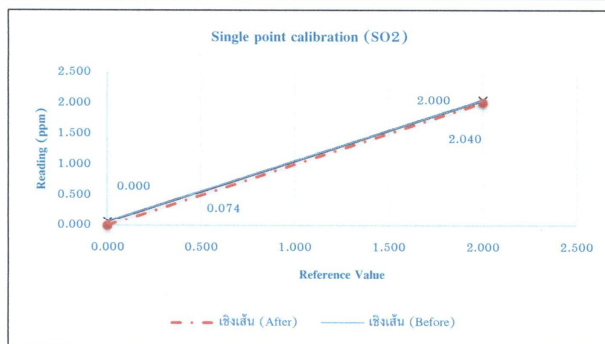
Gas Calibration : Thermo Environmental Zero Air Generator : API
Model : 146C Model : 701
Serial No. : 514811458 Serial No. : 179

Standard Gas

NO Conc. : 2 ppm Cylinder No. : CC750227
SO2 Conc. : 2 ppm Expire Date : 21-Nov-23
CO Conc. : 50 ppm

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
SO2	0.074	0.000	0.07	2.04	2.000	2.00
After						
SO2	0.000	0.000	0.00	2.00	2.000	0.00



Calibrated by :

Tong Piima
(Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 11-Mar-23 Certificate No. : 0323-003
Page : 1/1

Analyzer Instruments

Analyzer Type : NO/NO/NOx Analyzer Manufacturer : Thermo Environmental
Model : 42C Serial No. : 58926-320

Environmental

Temperature : 24.3 °C
Humidity : 51.4 %RH

Calibration System

Calibrator Units

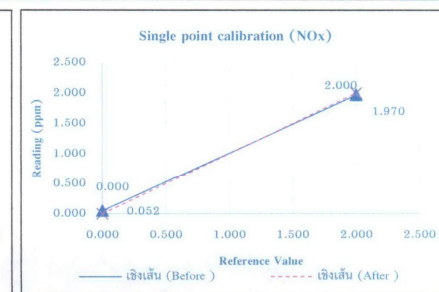
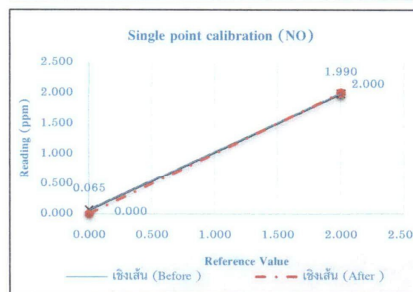
Gas Calibration : Thermo Environmental Zero Air Generator : API
Model : 146C Model : 701
Serial No. : 514811458 Serial No. : 179

Standard Gas

NO Conc. : 2 ppm Cylinder No. : CC750227
SO2 : 2 ppm Expire Date : 21-Nov-23
CO Conc. : 50 ppm

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
NO	0.065	0.000	0.07	1.99	2.00	-0.50
NOx	0.052	0.000	0.05	1.97	2.00	-1.50
After						
NO	0.000	0.000	0.00	2.00	2.00	0.00
NOx	0.000	0.000	0.00	2.00	2.00	0.00



Calibrated by :

Tong Piima
(Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 4-Jul-23 Certificate No. : 0723-001
Page : 1/1

Analyzer Instruments

Analyzer Type : NO/NO/NOx Analyzer Manufacturer : Thermo Environmental
Model : 42C Serial No. : 63470-339

Environmental

Temperature : 25.1 °C
Humidity : 40.4 %RH

Calibration System

Calibrator Units

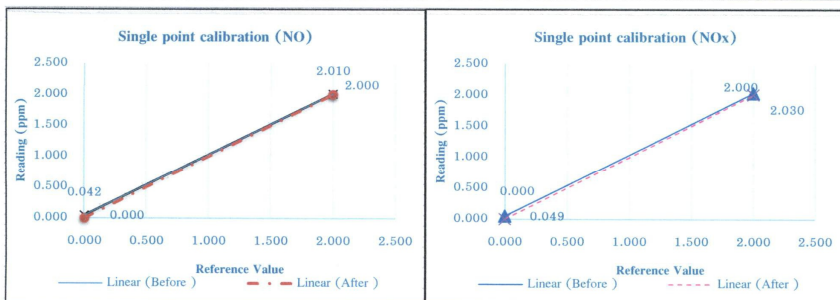
Gas Calibration : Thermo Environmental Zero Air Generator : API
Model : 146C Model : 701
Serial No. : 514811458 Serial No. : 179

Standard Gas

NO Conc. : 2 ppm Cylinder No. : CC750227
SO2 : 2 ppm Expire Date : 21-Nov-23
CO Conc. : 50 ppm

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
NO	0.042	0.000	0.04	2.01	2.00	0.50
NOx	0.049	0.000	0.05	2.03	2.00	1.50
After						
NO	0.000	0.000	0.00	2.00	2.00	0.00
NOx	0.000	0.000	0.00	2.00	2.00	0.00



Calibrated by :

Tong Piima
(Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 30-Jan-23 Certificate No. : 0123-001
Page : 1/1

Analyzer Instruments

Analyzer Type : THC Analyzer Manufacturer : Thermo Environmental
Model : 51 Serial No. : 51HT-73244-373

Environmental

Temperature : 24.7 °C
Humidity : 54.4 %RH

Calibration System

Calibrator Units

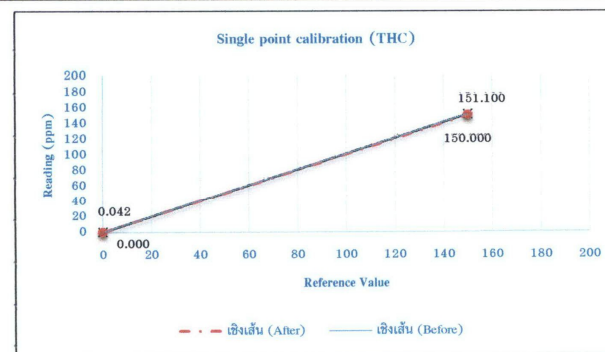
Gas Calibration : Thermo Environmental Zero Air Generator : API
Model : 146C Model : 701
Serial No. : 514811458 Serial No. : 179

Standard Gas

Propane Conc. : 150 ppm Cylinder No. : 21W281046
Expire Date : 26-Sep-25

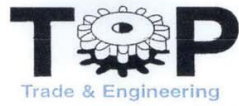
Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
THC	0.042	0.000	0.042	151	150	0.733
After						
THC	0.000	0.000	0.000	150	150	0.000



Calibrated by :

Tong Piima
(Mr. Tong Piima)



Certificate of Analyzer Performance Testing

Calibrated Date : 30-Jan-23 Certificate No. : 0123-002
Page : 1/1

Analyzer Instruments

Analyzer Type : THC Analyzer Manufacturer : Baseline
Model : Series 8800 Serial No. : 584

Environmental

Temperature : 24.5 °C
Humidity : 56.3 %RH

Calibration System

Calibrator Units

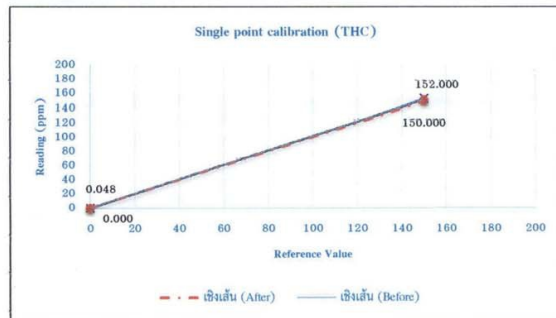
Gas Calibration : Thermo Environmental Zero Air Generator : API
Model : 146C Model : 701
Serial No. : 514811458 Serial No. : 179

Standard Gas

Propane Conc. : 150 ppm Cylinder No. : 21W281046
Expire Date : 26-Sep-25

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
THC	0.048	0.000	0.048	152	150	1.333
After						
THC	0.000	0.000	0.000	150	150	0.000



Calibrated by :

Tong Piima
(Mr. Tong Piima)

เอกสารการสอบเทียบเครื่องมือตรวจวัดความชื้นสะท้อน

Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM21467

Calibration Date: MAY 29 2023

Calibration Reference Equipment: 714J7403

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

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

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

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

Calibrated By: _____

Xiaoming Yang



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



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