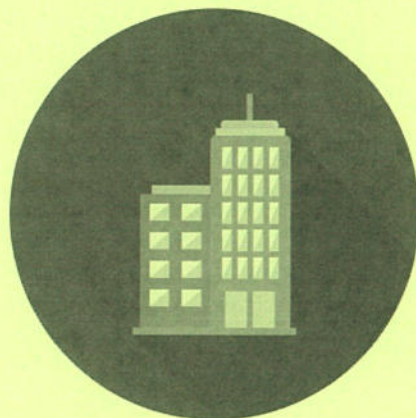


ภาคผนวก จ
เอกสารสอบเทียบเครื่องมือ
ที่ใช้ในการตรวจวิเคราะห์
(Calibration)



ตารางการสอบเทียบเครื่องมือที่ใช้ในการตรวจวัดและวิเคราะห์

Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
1.	Ambiant Air	TSP	ORIFICE TRANSFER STANDARD/Tisch	S/N 0068	19/11/2021	November 2022
			ORIFICE TRANSFER STANDARD/Tisch	S/N 0068	21/09/2022	September 2023
			High Volume Air Sampler/TET	S/N TSP-23	31/08/2022	August 2023
			High Volume Air Sampler/TET	S/N TSP-25	01/08/2022	August 2023
			High Volume Air Sampler/TET	S/N TSP-23	13/07/2023	July 2024
			High Volume Air Sampler/TET	S/N TSP-26	11/07/2023	July 2024
			High Volume Air Sampler/TET	S/N TSP-23	13/07/2023	July 2024
			High Volume Air Sampler/TET	S/N TSP-20	05/07/2023	July 2024
			High Volume Air Sampler/TET	S/N TSP-40	05/07/2023	July 2024
			High Volume Air Sampler/TET	S/N TSP-34	11/07/2023	July 2024
			High Volume Air Sampler/TET	S/N TSP-39	05/07/2023	July 2024
			High Volume Air Sampler/TET	S/N TSP-14	04/07/2023	July 2024
			High Volume Air Sampler/TET	S/N TSP-24	05/07/2023	July 2024
			Electronic Balance/METTLER TOLEDO	S/N 1116392227	11/04/2023	April 2024
		PM-10	ORIFICE TRANSFER STANDARD/Tisch	S/N 0068	19/11/2021	November 2022
			ORIFICE TRANSFER STANDARD/Tisch	S/N 0068	21/09/2022	September 2023
			High Volume Air Sampler/TET	S/N PM10-14	01/08/2022	August 2023
			High Volume Air Sampler/TET	S/N PM10-22	01/08/2022	August 2023
			High Volume Air Sampler/TET	S/N PM10-14	11/07/2023	July 2024
			High Volume Air Sampler/TET	S/N PM10-29	05/07/2023	July 2024
			High Volume Air Sampler/TET	S/N PM10-14	11/07/2023	July 2024
			High Volume Air Sampler/TET	S/N PM10-18	05/07/2023	July 2024
			High Volume Air Sampler/TET	S/N PM10-13	11/07/2023	July 2024
			High Volume Air Sampler/TET	S/N PM10-28	11/07/2023	July 2024
			High Volume Air Sampler/TET	S/N PM10-2	04/07/2023	July 2024
			High Volume Air Sampler/TET	S/N PM10-26	11/07/2023	July 2024
			High Volume Air Sampler/TET	S/N PM10-20	13/07/2023	July 2024
			Electronic Balance/METTLER TOLEDO	S/N 1116392227	11/04/2023	April 2024

1/4



TECH

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ตารางการสอบเทียบเครื่องมือที่ใช้ในการตรวจวัดและวิเคราะห์ (ต่อ)

Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
1.	Ambiant Air (Cont.)	NO _x	Certificate of Analysis/Linde	S/N A009625K	18/08/2021	August 2023
			NO _x Analyzer/Teledyne T200	S/N S158	12/05/2023	November 2023
			NO _x Analyzer/Teledyne 200E	S/N 974	12/05/2023	November 2023
			NO _x Analyzer/Teledyne 200E	S/N 481	11/05/2023	November 2023
			NO _x Analyzer/Teledyne 200E	S/N 2789	12/05/2023	November 2023
			NO _x Analyzer/Teledyne 200E	S/N 1173	10/05/2023	November 2023
			NO _x Analyzer/API 200A	S/N 1775	11/05/2023	November 2023
			NO _x Analyzer/API 200E	S/N 393	10/05/2023	November 2023
			NO _x Analyzer/API 200A	S/N 777	10/05/2023	November 2023
			NO _x Analyzer/API 200E	S/N 1732	10/05/2023	November 2023
			NO _x Analyzer/API 200A	S/N 2789	12/05/2023	November 2023
		SO ₂	Certificate of Analysis/Linde	S/N 118310	19/09/2019	September 2023
			SO ₂ Analyzer/Thermo 43C	S/N 43C-TL-67266366	12/05/2023	November 2023
			SO ₂ Analyzer/API 100E	S/N 2658	10/05/2023	November 2023
			SO ₂ Analyzer/API 100E	S/N 265E	10/05/2023	November 2023
			SO ₂ Analyzer/Teledyne TML-50	S/N SO2870	11/05/2023	November 2023
			SO ₂ Analyzer/API 100E	S/N 1412	11/05/2015	November 2023
			SO ₂ Analyzer/Teledyne 100E	S/N 062	16/05/2023	November 2023
			SO ₂ Analyzer/API 100E	S/N 383	10/05/2023	November 2023
			SO ₂ Analyzer/API 100A	S/N 195	10/05/2023	November 2023

2/4



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ตารางการสอบเทียบเครื่องมือที่ใช้ในการตรวจวัดและวิเคราะห์ (ต่อ)

Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
1.	Ambient Air (Cont.)	CO	CERTIFICATE OF ANALYSIS : Linde	S/N D824408	01/09/2015	September 2023
			CERTIFICATE OF ANALYSIS : Linde	S/N ND24989	01/09/2015	September 2023
			CO Analyzer/Horiba APMA 360CE	S/N 42088-7001	12/05/2023	November 2023
			CO Analyzer/Tytecne 300 E	S/N 1056	12/05/2023	November 2023
		HC as Methane	CO Analyzer/Thermo 42C	S/N 48062-846337	12/05/2023	November 2023
			Personal Air Sampler/Gilian	S/N 101155	01/07/2023	August 2023
			Personal Air Sampler/Gilian	S/N 20110505018	02/08/2023	September 2023
			Personal Air Sampler/Gilian	S/N 20140505073	01/09/2023	October 2023
			Personal Air Sampler/Gilian	S/N 20110605018	30/09/2023	October 2023
			Personal Air Sampler/Gilian	S/N 20080703006	02/11/2023	December 2023
			Personal Air Sampler/Gilian	S/N 20080703007	07/12/2023	January 2024
			Methane NMHC Analyzer/Model 55C	S/N 55C-72555-371	13/01/2023	January 2024
			pH Meter/Horiba F-71G	S/N V3B1F8H3	31/10/2023	October 2024
			Electronic Balance/METTLER TOLEDO	S/N 1116392227	11/04/2023	April 2024
			Electronic Balance/METTLER TOLEDO	S/N 1116392227	11/04/2023	April 2024
			BOD Incubator	ID/N TET.LAB.BOD 05	11/04/2023	April 2024
			Electronic Balance/METTLER TOLEDO	S/N 1116392227	11/04/2023	April 2024
2.	Wastewater	pH	Electronic Balance/METTLER TOLEDO	S/N 1116392227	11/04/2023	April 2024
		SS	Electronic Balance/METTLER TOLEDO	S/N 1116392227	11/04/2023	April 2024
		TDS	Electronic Balance/METTLER TOLEDO	S/N 1116392227	11/04/2023	April 2024
		BOD	BOD Incubator	ID/N TET.LAB.BOD 05	11/04/2023	April 2024
		Oil & Grease	Electronic Balance/METTLER TOLEDO	S/N 1116392227	11/04/2023	April 2024
		Sulfide	Spectrophotometer/PerkinElmer	S/N 365K9042909	18/08/2023	August 2024
		Total Coliform Bacteria	Incubator Model INE 500	S/N E.505.0595	19/04/2023	April 2024

3/4



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ตารางการสอบเทียบเครื่องมือที่ใช้ในการตรวจวัดและวิเคราะห์ (ต่อ)

Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
3.	Sound Level	Leq 24 hr	Sound Level Calibrator/TENMARS TM-100	S/N 181203570	16/01/2023	January 2024
			Integrated Sound Level/ACO TYPE 6226	S/N 160099	24/06/2023	31/07/2023
			Integrated Sound Level/ACO TYPE 6226	S/N 160212	24/06/2023	31/07/2023
			Integrated Sound Level/ACO TYPE 6226	S/N 160099	24/07/2023	31/08/2023
			Integrated Sound Level/ACO TYPE 6226	S/N 160096	24/07/2023	31/08/2023
			Integrated Sound Level/ACO TYPE 6226	S/N 070048	24/08/2023	30/09/2023
			Integrated Sound Level/ACO TYPE 6226	S/N 160099	24/08/2023	30/09/2023
			Integrated Sound Level/ACO TYPE 6226	S/N 100098	24/09/2023	31/10/2023
			Integrated Sound Level/ACO TYPE 6226	S/N 10099	24/09/2023	31/10/2023
			Integrated Sound Level/ACO TYPE 6226	S/N 110102	24/10/2023	30/11/2023
			Integrated Sound Level/ACO TYPE 6226	S/N 110106	24/10/2023	30/11/2023
			Integrated Sound Level/ACO TYPE 6226	S/N 160211	25/11/2023	31/12/2023
			Integrated Sound Level/ACO TYPE 6226	S/N 110105	25/11/2023	31/12/2023
4.	Vibration	Vibration	Vibration Meter/Micromate	S/N UM15905	17/01/2023	January 2024
			Vibration Meter/Micromate	S/N UM16047	17/01/2023	January 2024
			Vibration Meter	S/N UM10831	30/10/2023	October 2024
			Vibration Meter	S/N UM15362	23/10/2023	October 2024

4/4



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Tisch

Environmental

RECALIBRATION
DUE DATE:

November 19, 2022

RECALIBRATION
DUE DATE:

September 21, 2023

Certificate of Calibration

Calibration Certification Information

Cal. Date: November 19, 2021

Roots meter S/N: 438320

Operator: Jim Tisch

Calibration Model #: TE-5025A

Calibrator S/N: 0068

Ta: 294

Pa: 763.5

°K

mm Hg

Calibrator S/N: 0068

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4160	3.2	2.00
2	3	4	1	0.9970	6.4	4.00
3	5	6	1	0.8890	7.8	5.00
4	7	8	1	0.8490	8.7	5.50
5	9	10	1	0.6990	12.8	8.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\frac{\Delta H}{\Delta P} \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\frac{\Delta H}{\Delta P} \left(\frac{Pa}{Pa} \right)}$ (y-axis)
1.0140	0.7161	1.4272	0.9958	0.7053	0.8776
1.0098	1.0128	2.0182	0.9916	0.9946	1.2411
1.0079	1.1337	2.2564	0.9898	1.1134	1.3875
1.0067	1.1858	2.3666	0.9886	1.1644	1.4553
1.0012	1.4324	2.8542	0.9832	1.4066	1.7551
m=		1.99331	m=		1.24818
b=		-0.00049	b=		-0.00030
r=		0.99999	r=		0.99999

Calculations

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

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

Tisch Environmental, Inc.
145 South Miami Avenue
Village of Cleves, OH 45002

www.tischenv.com
TOLL FREE: (877)263-7610
FAX: (513)467-9009

Calibration Certification Information

Cal. Date: September 21, 2022

Roots meter S/N: 438320

Operator: Jim Tisch

Calibration Model #: TE-5025A

Calibrator S/N: 0068

Ta: 296

Pa: 748.3

°K

mm Hg

Calibrator S/N: 0068

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3760	3.2	2.00
2	3	4	1	0.9710	6.4	4.00
3	5	6	1	0.8790	8.0	5.00
4	7	8	1	0.8300	8.8	5.50
5	9	10	1	0.6870	12.7	8.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\frac{\Delta H}{\Delta P} \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\frac{\Delta H}{\Delta P} \left(\frac{Pa}{Pa} \right)}$ (y-axis)
0.9870	0.7173	1.4080	0.9957	0.7236	0.8895
0.9828	1.0121	1.9912	0.9914	1.0211	1.2579
0.9806	1.1283	2.2262	0.9893	1.1332	1.4064
0.9796	1.1802	2.3349	0.9882	1.1907	1.4750
0.9744	1.4184	2.8160	0.9830	1.4309	1.7789
m=		2.01042	m=		1.25889
b=		-0.03659	b=		-0.02312
r=		0.99996	r=		0.99996

Calculations

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

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

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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech Site ID : Bangkok Date : 1-Aug-22
ITEM : TSP Serial No : (No. 23) Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00 Corrected Pressure (mm Hg) : 760.0
Temperature (°C) : 25.0 Temperature (deg K) : 298.0
Average Press. (mm Hg) : 754.5 Corrected Average (mm Hg) : -
Average Temp (°C) : 32.1 Average Temp (Deg K) : -

Calibration Orifice

Make : Tisch Qstd Slope : 1.99333
Model : TE-5025A Qstd Intercept : -0.00049
Serial# : 0068 Calibration Due Date : 19-Nov-22

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	12.30	1.750	60.0	60.00	Slope : 34.6796
2	9.80	1.571	55.0	55.00	Intercept : 0.1411
3	7.60	1.383	50.0	50.00	Corr. Coeff : 0.9949
4	5.20	1.144	40.0	40.00	
5	3.00	0.869	30.0	30.00	
					of Observations: 5

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O)(Pa/Pstd)(Tstd/Ta)]-b$$
$$IC = [1/\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

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:

$$1/m(I)[\text{Sqrt}(298/Ta)(Pav/P760)]-b$$

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

Calibrate By : _____

Approve By : Pipat B

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



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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech Site ID : Bangkok Date : 1-Aug-22
ITEM : TSP Serial No : (No. 25) Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00 Corrected Pressure (mm Hg) : 760.0
Temperature (°C) : 25.0 Temperature (deg K) : 298.0
Average Press. (mm Hg) : 754.5 Corrected Average (mm Hg) : -
Average Temp (°C) : 32.1 Average Temp (Deg K) : -

Calibration Orifice

Make : Tisch Qstd Slope : 1.99331
Model : TE-5025A Qstd Intercept : -0.00019
Serial# : 0068 Calibration Due Date : 19-Nov-22

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	12.20	1.753	60.0	60.00	Slope : 34.0904
2	9.40	1.558	54.0	54.00	Intercept : 1.1065
3	7.20	1.316	50.0	50.00	Corr. Coeff : 0.9915
4	5.00	1.122	40.0	40.00	
5	3.00	0.869	30.0	30.00	
					of Observations: 5

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O)(Pa/Pstd)(Tstd/Ta)]-b$$
$$IC = [1/\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

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:

$$1/m(I)[\text{Sqrt}(298/Ta)(Pav/P760)]-b$$

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

Calibrate By : _____

Approve By : Pipat B

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



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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech Site ID : Bangkok Date : 11-Jul-23
ITEM : TSP Serial No : (No.26) Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 750.00 Corrected Pressure (mm Hg) : 750.0
Temperature (°C) : 29.0 Temperature (deg K) : 298.0
Average Press. (mm Hg) : 750.5 Corrected Average (mm Hg) :
Average Temp (°C) : 28.7 Average Temp. (Deg K) :

Calibration Office

Make : Tisch Qstd Slope : 2.01042
Model : TR-5025A Qstd Intercept : -0.36590
Serial# : 0068 Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	12.90	1.969	56.0	56.00	Slope : 28.2957
2	9.80	1.739	52.0	52.00	Intercept : 2.4965
3	7.80	1.571	50.0	50.00	Corr. Coeff : 0.9783
4	5.00	1.294	40.0	40.00	
5	3.00	1.044	30.0	30.00	

Calculations


$$Q_{std} = 1/m[\sqrt{(Pa/Pstd)(Ta/Tstd)(Tstd/Ta))}] - b]$$
$$IC = [1/\sqrt{(Pa/Pstd)(Tstd/Ta))}]$$


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


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

Calibrate By : 

Approve By : 

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

Calibrate By : 

Approve By : 



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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech Site ID : Bangkok Date : 13-Jul-23
ITEM : TSP Serial No : (No.23) Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 750.00 Corrected Pressure (mm Hg) : 760.0
Temperature (°C) : 29.0 Temperature (deg K) : 298.0
Average Press. (mm Hg) : 750.5 Corrected Average (mm Hg) :
Average Temp (°C) : 29.2 Average Temp. (Deg K) :

Calibration Office

Make : Tisch Qstd Slope : 2.01042
Model : TR-5025A Qstd Intercept : -0.36590
Serial# : 0068 Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	23.50	1.941	50.0	50.00	Slope : 30.2297
2	9.20	1.691	54.0	52.00	Intercept : 0.1413
3	7.20	1.517	50.0	48.00	Corr. Coeff : 0.9873
4	5.00	1.294	40.0	40.00	
5	3.00	1.044	30.0	30.00	

Calculations


$$Q_{std} = 1/m[\sqrt{(Pa/Pstd)(Ta/Tstd)(Tstd/Ta))}] - b]$$
$$IC = [1/\sqrt{(Pa/Pstd)(Tstd/Ta))}]$$


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

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

Calibrate By : 

Approve By : 

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



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บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech
ITEM : TSP
Site ID : Bangkok
Serial No : (No. 20)
Date : 5-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Average Press. (mm Hg) : 750.6
Average Temp (°C) : 27.9
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Corrected Average (mm Hg) :
Average Temp: (Deg K) :

Calibration Orifice

Make : Tisch
Model : TE-5025A
Serial# : 0068
Qstd Slope : 2.01042
Qstd Intercept : -0.36590
Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 30.3274 Intercept : 0.9037 Corr. Coeff : 0.9037
1	12.50	2.941	60.0	57.00	
2	9.00	3.674	54.0	52.00	
3	7.00	3.498	50.0	48.00	
4	5.00	1.294	40.0		
5	3.00	1.044	30.0	30.00	of Observations: 5

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O)(Pa/Pstd)(Tstd/Ta)] - b$$
$$IC = [1/\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

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:

$$1/m(I)[\text{Sqrt}(298/Tav)(Pav/P760)] - b$$

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

Calibrate By : _____

Approve By : _____

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



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บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech
ITEM : TSP
Site ID : Bangkok
Serial No : (No. 40)
Date : 5-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Average Press. (mm Hg) : 750.6
Average Temp (°C) : 28.9
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Corrected Average (mm Hg) :
Average Temp: (Deg K) :

Calibration Orifice

Make : Tisch
Model : TE-5025A
Serial# : 0068
Qstd Slope : 2.01042
Qstd Intercept : -0.36590
Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 29.4911 Intercept : 1.2335 Corr. Coeff : 0.9818
1	12.80	1.962	60.0	57.00	
2	9.20	1.693	54.0	52.00	
3	7.00	1.498	50.0	48.00	
4	5.00	1.294	40.0		
5	3.00	1.044	30.0	30.00	of Observations: 5

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O)(Pa/Pstd)(Tstd/Ta)] - b$$
$$IC = [1/\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

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:

$$1/m(I)[\text{Sqrt}(298/Tav)(Pav/P760)] - b$$

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

Calibrate By : _____

Approve By : _____

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



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Technic
ITEM : TSP
Site ID : Bangkok
Serial No : (No.34)
Date : 11-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Average Press. (mm Hg) : 750.6
Average Temp (°C) : 29.4
Corrected Average (mm Hg) :
Average Temp (deg K) :

Calibration Office

Make : Tisch
Model : TE-5025A
Serial# : 0068
Qstd Slope : 2.01042
Qstd Intercept : -0.36590
Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	12.40	1.934	60.0	57.00	Slope : 30.2039
2	9.40	1.707	54.0	52.00	Intercept : 0.2667
3	7.00	1.498	50.0	48.00	Corr. Coeff : 0.9859
4	5.00	1.294	40.0	40.00	
5	3.00	1.044	30.0	30.00	of Observations: 5

Calculations

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

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:

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

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

Calibrate By : _____

Approve By : _____

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

Approve By : _____



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Technic
ITEM : TSP
Site ID : Bangkok
Serial No : (No.39)
Date : 5-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Average Press. (mm Hg) : 750.6
Average Temp (°C) : 28.9
Corrected Average (mm Hg) :
Average Temp (deg K) :

Calibration Office

Make : Tisch
Model : TE-5025A
Serial# : 10058
Qstd Slope : 2.01042
Qstd Intercept : -0.36590
Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	12.80	1.962	60.0	57.00	Slope : 29.4911
2	9.20	1.692	54.0	52.00	Intercept : 1.2335
3	7.00	1.458	50.0	48.00	Corr. Coeff : 0.9818
4	5.00	1.254	40.0	40.00	
5	3.00	1.044	30.0	30.00	of Observations: 5

Calculations

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

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:

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

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

Calibrate By : _____

Approve By : _____

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



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บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech
ITEM : TSP

Site ID : Bangkok
Serial No : (No.24)
Date : 5-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Average Press. (mm Hg) : 750.3
Average Temp (°C) : 28.6
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Corrected Average (mm Hg) :
Average Temp: (Deg K) :

Calibration Office

Make : Flisch
Model : TE-5025A
Serial#: 0068

Qstd Slope : 2.01042
Qstd Intercept : -0.36590
Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 30.2297 Intercept : 0.3184 Corr. Coeff : 0.9875
1	12.50	1.941	60.0	57.00	
2	9.20	1.691	54.0	52.00	
3	7.20	1.517	50.0	48.00	
4	5.00	1.294	40.0	40.00	
5	3.00	1.044	30.0	30.00	

Calculations

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

Qstd = standard flow rate
IC = corrected chart response
I = actual chart response

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

Calibrate By : Pipat

Approve By : Pipat

Tstd = 298 deg K
Pstd = 760 mm Hg
For subsequent calculation of sampler flow:
 $1/m \sqrt{(Pa/Pstd)(Tav/Pav)(Tstd/Ta)-b}$

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



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech
ITEM : TSP

Site ID : Bangkok
Serial No : (No.14)
Date : 4-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Average Press. (mm Hg) : 750.3
Average Temp (°C) : 28.2
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Corrected Average (mm Hg) :
Average Temp: (Deg K) :

Calibration Office

Make : Flisch
Model : TE-5025A
Serial#: 0068

Qstd Slope : 2.01042
Qstd Intercept : -0.36590
Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 30.0460 Intercept : 0.3184 Corr. Coeff : 0.9881
1	12.50	1.941	60.0	57.00	
2	9.40	1.707	54.0	52.00	
3	7.20	1.517	50.0	48.00	
4	5.00	1.294	40.0	40.00	
5	3.00	1.044	30.0	30.00	

Calculations

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

Qstd = standard flow rate
IC = corrected chart response
I = actual chart response

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

Calibrate By : Pipat

Approve By : Pipat

Tstd = 298 deg K
Pstd = 760 mm Hg
For subsequent calculation of sampler flow:
 $1/m \sqrt{(Pa/Pstd)(Tav/Pav)(Tstd/Ta)-b}$

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



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Technic Site ID : Bangkok Date : 1-Aug-22
ITEM : PM10 Serial No : (No. 14) Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00 Corrected Pressure (mm Hg) : 760.0
Temperature (°C) : 28.5 Corrected Temperature (deg K) : 298.0
Average Press. (mm Hg) : 750.5 Corrected Average (mm Hg) : -
Average Temp (°C) : 28.2 Average Temp: (Deg K) : -

Calibration Office

Make : Tisch Qstd Slope : 1.99311
Model : TE-5025A Qstd Intercept : -0.00049
Serial# : 0058 Calibration Due Date : 19-Nov-22

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	12.00	1.738	50.0	50.00	Slope : 34.8208
2	9.20	1.522	54.0	54.00	Intercept : 0.8400
3	7.20	1.346	50.0	50.00	Corr. Coeff : 0.9926
4	5.00	1.122	40.0	40.00	
5	3.00	0.869	30.0	30.00	

Calculations


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


Qstd = standard flow rate
IC = corrected chart response
1 = 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:
 $1/m[(1/\sqrt{(298/Tav)(Pav/760))}] - b]$

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

Calibrate By : 

Approve By : 



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Technic Site ID : Bangkok Date : 5-Jul-23
ITEM : PM10 Serial No : (No. 18) Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00 Corrected Pressure (mm Hg) : 760.0
Temperature (°C) : 28.5 Corrected Temperature (deg K) : 298.0
Average Press. (mm Hg) : 750.5 Corrected Average (mm Hg) : -
Average Temp (°C) : 28.5 Average Temp: (Deg K) : -

Calibration Office

Make : Tisch Qstd Slope : 2.01042
Model : TE-5025A Qstd Intercept : 0.00659
Serial# : 0068 Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	12.00	1.741	50.0	50.00	Slope : 35.0529
2	9.20	1.527	54.0	54.00	Intercept : 0.4420
3	7.00	1.134	50.0	50.00	Corr. Coeff : 0.9897
4	5.00	1.130	40.0	40.00	
5	3.00	0.880	30.0	30.00	

Calculations

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

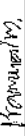
Qstd = standard flow rate
IC = corrected chart response
1 = actual chart response

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

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

Calibrate By : 

Approve By : 



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บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech Site ID : Bangkok Date : 1-Aug-22
ITEM : PM10 Serial No : (No. 22) Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00 Corrected Pressure (mm Hg) : 760.0
Temperature (°C) : 25.0 Temperature (deg K) : 298.0
Average Press. (mm Hg) : 754.5 Corrected Average (mm Hg) :
Average Temp (°C) : 31.2 Average Temp (deg K) :

Calibration Office

Make : Tisch Qstd Slope : 1.99331
Model : TS-5025A Qstd Intercept : -0.00049
Serial# : 0068 Calibration Due Date : 19-Nov-22

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope	Linear Regression Intercept	Linear Regression Corr. Coeff
1	12.20	1.753	62.0	62.00	36.1714		
2	9.60	1.555	56.0	56.00	0.0348		
3	7.40	1.385	52.0	52.00			
4	5.20	1.144	42.0	42.00			
5	3.00	0.869	30.0	30.00			

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O)(Pa/Pstd)(Tstd/Ta)] \cdot b$$
$$IC = [(\text{Sqrt}(Pa/Pstd)(Tstd/Ta))] \cdot b$$

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:
 $1/m[(\text{Sqrt}(298/Ta)(Pav/P760))] \cdot b$

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

Calibrate By : _____

Approve By : _____



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech Site ID : Bangkok Date : 11-Jul-23
ITEM : PM10 Serial No : (No. 15) Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 260.00 Corrected Pressure (mm Hg) : 260.0
Temperature (°C) : 25.0 Temperature (deg K) : 298.0
Average Press. (mm Hg) : 750.6 Corrected Average (mm Hg) :
Average Temp (°C) : 29.5 Average Temp (deg K) :

Calibration Office

Make : Tisch Qstd Slope : 2.01042
Model : TE-5025A Qstd Intercept : -0.03659
Serial# : 0068 Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope	Linear Regression Intercept	Linear Regression Corr. Coeff
1	12.00	1.741	60.0	60.00	35.3007		
2	9.00	1.510	54.0	54.00	0.2307		
3	7.00	1.314	50.0	50.00			
4	5.00	1.130	40.0	40.00			
5	3.00	0.860	30.0	30.00			

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O)(Pa/Pstd)(Tstd/Ta)] \cdot b$$
$$IC = [(\text{Sqrt}(Pa/Pstd)(Tstd/Ta))] \cdot b$$

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:
 $1/m[(\text{Sqrt}(298/Ta)(Pav/P760))] \cdot b$

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

Calibrate By : _____

Approve By : _____



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Technic
ITEM : PM10
Site ID : Bangkok
Serial No : (No. 14)
Date : 11-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 29.0
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Average Press. (mm Hg) : 750.8
Average Temp (°C) : 29.5
Corrected Average (mm Hg) : -
Average Temp (deg K) : -

Calibration Orifice

Make : Tishch
Model : TE-5025A
Serial# : 0968
Qstd Slope : 2.01042
Qstd Intercept : -0.03659
Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m ³ /min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	12.00	1.741	60.0	60.00	Slope : 35.1297
2	9.20	1.527	54.0	54.00	Intercept : 0.2002
3	7.20	1.353	50.0	50.00	Corr. Coeff : 0.9926
4	5.00	1.130	40.0	40.00	
5	3.00	0.880	30.0	30.00	# of Observations: 5

Calculations

$$Qstd = 1/m[\text{Sort}(H_2O(Pa/Pstd)(Tstd/Ta))-b]$$
$$IC = 1/[\text{Sort}(Pa/Pstd)(Tstd/Ta)]$$

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:
 $1/m[(1/[\text{Sort}(298/Tav)(Pav/760)])-b]$

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

Approve By : Pipat

Calibrate By : Pipat

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



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Technic
ITEM : PM10
Site ID : Bangkok
Serial No : (No. 29)
Date : 5-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 29.0
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Average Press. (mm Hg) : 750.8
Average Temp (°C) : 28.7
Corrected Average (mm Hg) : -
Average Temp (deg K) : -

Calibration Orifice

Make : Tishch
Model : TE-5025A
Serial# : 0968
Qstd Slope : 2.01042
Qstd Intercept : -0.03659
Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m ³ /min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	12.20	1.756	60.0	60.00	Slope : 34.1704
2	9.60	1.539	54.0	54.00	Intercept : 1.0242
3	7.40	1.371	50.0	50.00	Corr. Coeff : 0.9939
4	5.00	1.130	40.0	40.00	
5	3.00	0.880	30.0	30.00	# of Observations: 5

Calculations

$$Qstd = 1/m[\text{Sort}(H_2O(Pa/Pstd)(Tstd/Ta))-b]$$
$$IC = 1/[\text{Sort}(Pa/Pstd)(Tstd/Ta)]$$

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:
 $1/m[(1/[\text{Sort}(298/Tav)(Pav/760)])-b]$

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

Approve By : Pipat

Calibrate By : Pipat

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



Thai Environmental Technic Limited
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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Technic
ITEM : PM10
Site ID : Bangkok
Serial No : (No. 28)
Date : 11-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.0
Temperature (°C) : 25.0
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Average Press. (mm Hg) : 750.6
Corrected Average (mm Hg) : -
Average Temp (°C) : 28.5
Average Temp (Deg K) : -

Calibration Orifice

Make : Ttech
Model : TE-5025A
Serial# : 0068
Qstd Slope : 2.01042
Qstd Intercept : -0.03659
Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 34.8675 Intercept : 0.4432 Corr. Coeff : 0.9926
1	12.00	1.741	60.0	60.00	
2	9.20	1.527	54.0	54.00	
3	7.20	1.353	50.0	50.00	
4	5.00	1.130	40.0	40.00	
5	3.00	0.880	30.0	30.00	

Calculations

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

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:

$1/m[1/\sqrt{Pa/Pstd}(Tstd/Ta)]$

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



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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Technic
ITEM : PM10
Site ID : Bangkok
Serial No : (No. 2)
Date : 4-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.0
Temperature (°C) : 25.0
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Average Press. (mm Hg) : 750.6
Corrected Average (mm Hg) : -
Average Temp (°C) : 28.2
Average Temp (Deg K) : -

Calibration Orifice

Make : Ttech
Model : TE-5025A
Serial# : 0068
Qstd Slope : 2.01042
Qstd Intercept : -0.03659
Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m3/min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 35.1297 Intercept : 0.2092 Corr. Coeff : 0.9926
1	12.00	1.741	60.0	60.00	
2	9.20	1.527	54.0	54.00	
3	7.20	1.353	50.0	50.00	
4	5.00	1.130	40.0	40.00	
5	3.00	0.880	30.0	30.00	

Calculations

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

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:

$1/m[1/\sqrt{Pa/Pstd}(Tstd/Ta)]$

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



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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech
ITEM : PM10
Site ID : Bangkok
Serial No : (No. 26)
Date : 11-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 766.00
Temperature (°C) : 35.0
Average Press. (mm Hg) : 750.6
Average Temp (°C) : 28.7
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Corrected Average (mm Hg) : -
Average Temp: (Deg K) : -

Calibration Orifice

Make : TISCH
Model : TE-5025A
Serial# : 0068
Qstd Slope : 2.01042
Qstd Intercept : -0.03659
Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m ³ /min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	12.20	1.741	60.0	60.00	Slope : 0.0529
2	9.20	1.927	54.0	54.00	Intercept : 0.4430
3	7.00	1.334	50.0	50.00	Corr. Coeff : 0.9837
4	5.00	1.130	40.0	40.00	
5	3.00	0.880	30.0	30.00	# of Observations: 5

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O/Pa/Pstd)(Tstd/Ta)] - b$$
$$IC = [1/\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

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:

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

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

Calibrate By :

Approve By :

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



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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech
ITEM : PM10
Site ID : Bangkok
Serial No : (No. 20)
Date : 13-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Average Press. (mm Hg) : 750.6
Average Temp (°C) : 29.3
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Corrected Average (mm Hg) : -
Average Temp: (Deg K) : -

Calibration Orifice

Make : TISCH
Model : TE-5025A
Serial# : 0068
Qstd Slope : 2.01042
Qstd Intercept : -0.03659
Calibration Due Date : 21-Sep-23

Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m ³ /min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	12.20	1.756	60.0	60.00	Slope : 0.6241
2	9.20	1.527	54.0	54.00	Intercept : 0.7804
3	7.20	1.333	50.0	50.00	Corr. Coeff : 0.9913
4	5.00	1.130	40.0	40.00	
5	3.00	0.880	30.0	30.00	# of Observations: 5

Calculations

$$Qstd = 1/m[\text{Sqrt}(H_2O/Pa/Pstd)(Tstd/Ta)] - b$$
$$IC = [1/\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

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:

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

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

Calibrate By :

Approve By :

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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES IN EQUIPMENT CALIBRATION AND TESTING SERVICES
53/64 PATTANAKARN ROAD SOI 18, SUKHUMVIT 21, BANGKOK 10250
TEL. 0-2713-3003-29 FAX. 0-2716-6144



Cert.No.: 23MM160
Page: 1 of 3

Certificate of Calibration

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204
Serial No. : 1116392227
ID No. : TET LAB BAL01

Submitted by : Thai Environmental Technic Limited
116 Soi Ramkhamhaeng 145,
Khwaeng/Khet Saphan Sung,
Bangkok 10240

Location : Balance Room

Received order : 10 April 2023
Calibration Date : 11 April 2023
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %

Calibrated by : Khit Rutanasapachai
Approved by :
Approved Signatory

() Pornthippa Tameyakul
() Malee Buikruae
() Suwit Injai

Issue Date : 25 April 2023

The Uncertainties are for a confidence probability of approximately 95%
This certificate may not be reproduced without the prior written
Approval of the Head of Corporate Services & Equipment Calibration and Testing Services.

A 0053464



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2304-01/460C-12

Procedure used :-

Calibration were conducted using in-house calibration procedure CP-OB01 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
Standard Weight Set (E2)	15894	24053	70RC007	MM-0010-22	20 Jan 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This result of calibration was made on requested at the point specified by customer.
4. This certificate is not certified for any commercial transaction.
5. This certification is traceable to the International System of Unit.

Result of calibration () Without Adjustment (*) After Adjustment by External Calibration

Range capacity : 0 g to 210 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
100	99.9832	+0.0016	0.18	2.00
200	199.9865	+0.0035	0.29	2.00

After Adjustment :

1. Determination of the standard deviation of weighing machine (n = 10)

Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00007
200	0.00007

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a 1158499



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2304-014600-12

Result of calibration

2. Effect of off center loading

A mass of 100 g was placed to various position on the pan.

The weighing machine reading error obtained is given in the table

Position 1	Position 2	Position 3	Position 4	Position 5
(g)	(g)	(g)	(g)	(g)
-0.0002	-0.0002	-0.0003	-0.0008	-0.0002

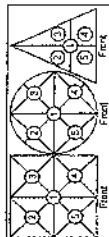
3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	0.0000	0.0000	0.14	2.11
0.01	0.0100	0.0000	0.14	2.11
0.1	0.1001	-0.0001	0.14	2.11
0.5	0.5000	0.0000	0.14	2.11
1	1.0001	-0.0001	0.14	2.11
5	5.0000	0.0000	0.14	2.11
10	9.9999	+0.0001	0.14	2.11
25	24.9998	+0.0002	0.15	2.07
50	49.9998	+0.0002	0.16	2.05
100	99.9999	+0.0001	0.18	2.00
200	200.0000	0.0000	0.29	2.00

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

-000-

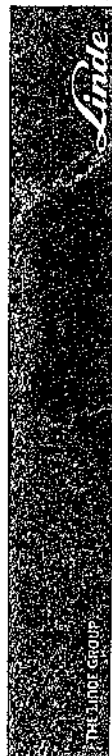
Cert.No.: 23MM160
Page: 3 of 3



Maximum difference between
off-center and central loading
(g)
0.0001

Wala

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Certificate of Analysis
Special Goods Analysis

Customer Details
Name: The Linde Group (Thailand) Public Co., Ltd.
Address: 1/6 S1 Paraphramlaeng 45, Khwaeng Sai Haeng, Bangkok 10240

Certificate Details
Sample: 3452-21
Date of Issue: 18-Aug-2021
Expiry Date: 18-Aug-2023
Material Code: 610306-04-44
Sampling Location: 145.0 Bar
Cylinder Material: SPF033521
Cylinder Size: 40L

Library Report
Component: Gas (Oxygen)
Concentration: 99.9999
Unit: % by volume
Method of Analysis: (S) 6103352
Expiry Date: 31-Aug-2023

Reference Standard used in Assay
Cylinder number: 21801150
Concentration: 51.58 ± 0.41 ppm
Expiry date: 29-Oct-2022

Analytical Instruments used in Assay
Analytical Principle: THERMO
Last calibration date: 9-Aug-2021

Recommended safety condition
Maximum safe pressure: 5% of actual content or before expiration date whichever comes first
Storage condition: Store in well ventilated and secure place
Comments: When refilling, please provide the right and number

Notes
1. All gases are pure oxygen (99.9999% by volume) and are not to be used for breathing purposes.
2. The gas is not to be used for any other purpose than the one specified in the certificate.
3. The gas is not to be used for any other purpose than the one specified in the certificate.
4. The gas is not to be used for any other purpose than the one specified in the certificate.

Signature: [Signature]
Name: [Name]
Title: [Title]
Date: [Date]



Thai Environmental Technic Limited
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Analyzer Calibration Report

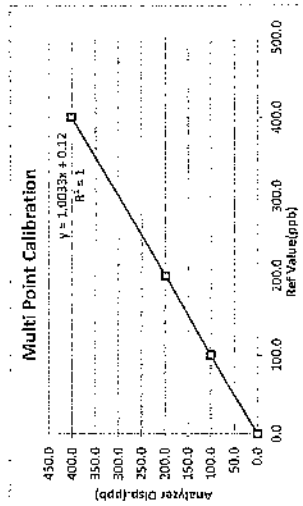
Calibrate Date : 12-May-23
Analyzer Type : NOx
Brand : Teledyne
Model : T200
Serial Number : 5158 (No.31)
Range : 500 ppb
Temperature (°C) : 25°C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.08RH
Dilutor : API 8700 S/N 525
Zero Air : API 8701 S/N 1926
Standard gas : A00962 SK

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span (ppb)			After of Span (ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	1.1	0.8	0.3	0.0	0.0	0.0	0.0
Span	400.0	398.7	398.1	0.5	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)			Output Difference		
	NOx	NO	NO ₂	Diff(ppb)	% Diff	Abs (%) Diff
0.0	0.4	0.4	0.0	0.40	0.001	0.10
100.0	101.2	101.2	0.0	1.20	0.012	1.20
200.0	199.5	199.1	0.4	-0.20	-0.005	0.45
400.0	402.3	402.1	0.2	2.10	0.005	0.53
Average Diff (%)						
0.73						



Calibrate by: Jhns.

Approved by: Piyachon B.



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Analyzer Calibration Report

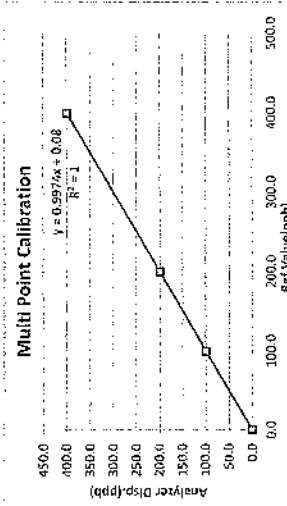
Calibrate Date : 12-May-23
Analyzer Type : NOx
Brand : Teledyne
Model : T200 E
Serial Number : 974 (No.34)
Range : 500 ppb
Temperature (°C) : 25°C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.08RH
Dilutor : API 8700 S/N 525
Zero Air : API 8701 S/N 1926
Standard gas : A00962 SK

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span (ppb)			After of Span (ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	2.3	2.1	0.2	0.0	0.0	0.0	0.0
Span	400.0	398.7	395.2	3.5	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)			Output Difference		
	NOx	NO	NO ₂	Diff(ppb)	% Diff	Abs (%) Diff
0.0	0.4	0.4	0.0	0.40	0.001	0.10
100.0	99.7	99.5	0.2	-0.50	-0.005	0.50
200.0	199.6	199.4	0.3	-0.60	-0.003	0.30
400.0	399.8	399.2	0.6	-0.80	-0.002	0.20
Average Diff (%)						
0.28						



Calibrate by: Jhns.

Approved by: Piyachon B.



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Analyzer Calibration Report

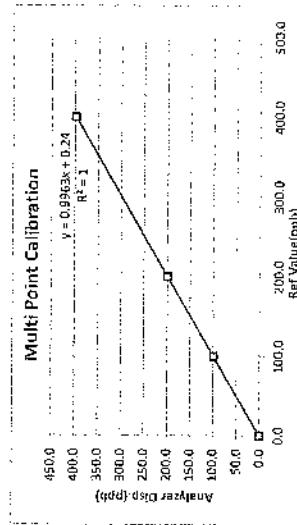
Calibrate Date : 11-May-23
Analyzer Type : NOx
Brand : Teledyne
Model : 200 E
Serial Number : 481 (No. 37)
Range : 500 ppb
Temperature (°C) : 25 °C
Barometer (mmHg) : 750.0
Humidity (Std 15 %) : 50.0 RH
Dilutor : API M701 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 500 ppb

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span(ppb)			After of Span(ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	1.3	1.0	0.3	0.0	0.0	0.0	0.0
Span	400.0	423.0	430.0	3.0	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)			Output Difference		
	NOx	NO	NO ₂	Diff(ppb)	% Diff	Abs (% Diff
0.0	0.5	0.3	0.2	0.30	0.001	0.08
100.0	101.2	99.8	1.4	-0.20	-0.002	0.20
200.0	199.7	199.5	0.2	-0.50	-0.003	0.25
400.0	399.4	398.8	0.6	-1.20	-0.003	0.30
Average Diff (%)						0.21



Calibrate by: John S.
Approved by: Pigada B



Thai Environmental Technic Limited
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Analyzer Calibration Report

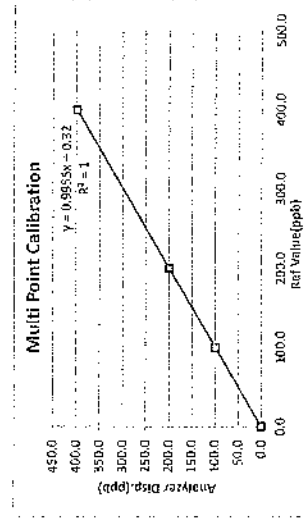
Calibrate Date : 12-May-23
Analyzer Type : NOx
Brand : Teledyne
Model : 200 E
Serial Number : 2789 (No. 36)
Range : 500 ppb
Temperature (°C) : 25 °C
Barometer (mmHg) : 750.0
Humidity (Std 15 %) : 50.0 RH
Dilutor : API M701 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 500 ppb

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span(ppb)			After of Span(ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	0.3	0.1	0.2	0.0	0.0	0.0	0.0
Span	400.0	387.0	382.0	5.0	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)			Output Difference		
	NOx	NO	NO ₂	Diff(ppb)	% Diff	Abs (% Diff
0.0	0.5	0.4	0.1	0.40	0.001	0.30
100.0	99.8	99.7	0.1	-0.30	-0.003	0.30
200.0	199.8	199.5	0.2	-0.50	-0.003	0.25
400.0	398.7	398.5	0.2	-1.50	-0.004	0.38
Average Diff (%)						0.26



Calibrate by: John S.
Approved by: Pigada B



TEI

Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

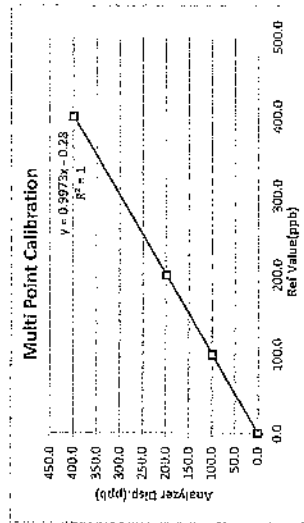
Calibrate Date : 10-May-23
Analyzer Type : NOx
Brand : Telesys
Model : 200 B
Serial Number : 1173 (No. 35)
Range : 500 ppb
Temperature (°C) : 25°C
Barometer (mmHg) : 759.1
Humidity (50±15 %) : 50.0%RH
Dilutor : API M700 S/N 625
Zero Air : API M703 S/N 1926
Standard gas : ADO962 EX

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span (ppb)			After of Span (ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	1.3	1.1	0.2	0.0	0.0	0.0	0.0
Span	400.0	387.0	388.0	-1.0	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp. (ppb)			Output Difference		
	NOx	NO	NO ₂	Diff(ppb)	% Diff	Abs (% Diff)
0.0	0.6	0.4	0.2	0.40	0.001	0.10
100.0	99.1	99.0	0.1	-1.00	-0.010	1.00
200.0	198.7	198.5	0.3	-1.50	-0.008	0.75
400.0	399.2	399.1	0.1	-0.90	-0.002	0.22
Average Diff (%)						0.52



Calibrate by: Y.S.

Approved by: Piyasak B.

วันที่ตรวจ : 00

วันที่อนุมัติ : 03/05/15

Thai Environmental Technic Limited 1/6 Soi Raminthabong 145 Khwaeng/Khet Saphan Song Bangkok 10240 Thailand
• Tel : +66(0)2373-7799 (Auto) Fax : +66(0)2373-7979 • admin@te1995.com • www.te1995.com

เลขที่ใบตรวจ : QF-OP-1606



TEI

Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

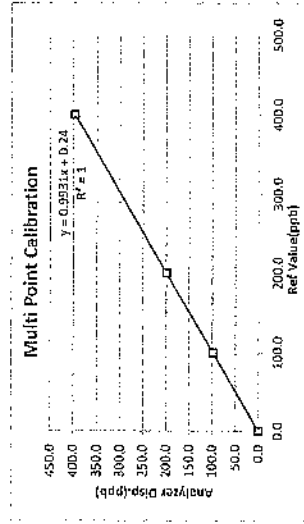
Calibrate Date : 11-May-23
Analyzer Type : NOx
Brand : API
Model : 200 A
Serial Number : 1773 (NO.26)
Range : 500 ppb
Temperature (°C) : 25°C
Barometer (mmHg) : 759.9
Humidity (50±15 %) : 50.0%RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : ADO962 SX

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span (ppb)			After of Span (ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	2.5	2.3	0.3	0.0	0.0	0.0	0.0
Span	400.0	388.0	384.0	4.0	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp. (ppb)			Output Difference		
	NOx	NO	NO ₂	Diff(ppb)	% Diff	Abs (% Diff)
0.0	0.5	0.4	0.1	0.40	0.001	0.10
100.0	99.8	98.7	1.1	-1.30	-0.013	1.30
200.0	199.3	199.8	-0.5	-0.20	-0.001	0.10
400.0	398.7	397.2	1.5	-2.80	-0.007	0.70
Average Diff (%)						0.55



Calibrate by: Y.S.

Approved by: Piyasak B.

วันที่ตรวจ : 00

วันที่อนุมัติ : 03/05/15

The Environmental Technic Limited 1/6 Soi Raminthabong 145 Khwaeng/Khet Saphan Song Bangkok 10240 Thailand
• Tel : +66(0)2373-7799 (Auto) Fax : +66(0)2373-7979 • admin@te1995.com • www.te1995.com

เลขที่ใบตรวจ : QF-OP-1606



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

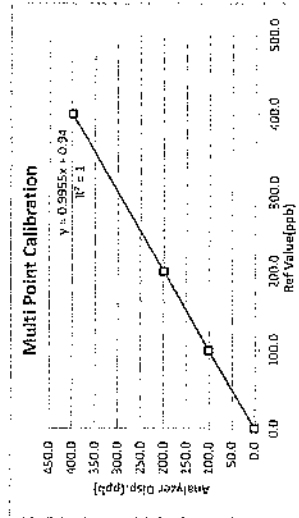
Calibrate Date : 10-May-23
Analyzer Type : NOx
Brand : API
Model : 200 A
Serial Number : 777 (No. 23)
Range : 500 ppb
Temperature (°C) : 23.4
Barometer (mmHg) : 759.9
Humidity (50±15 %) : 50.04RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1326
Standard gas : A00962 SK

Calibration of Span

Supply Gas	Ref Value (ppb)	Before of Span (ppb)			After of Span (ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	3.5	3.1	0.4	0.0	0.0	0.0	0.0
Span	400.0	387.0	382.0	5.0	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value (ppb)	Analyzer Disp (ppb)			Output Difference		Abs (%) Diff
	NOx	NO	NO ₂	Diff (ppb)	% Diff	
0.0	0.8	0.4	0.4	0.40	0.001	0.10
100.0	101.3	101.5	-0.2	1.50	0.015	1.50
200.0	199.8	199.6	0.2	-0.40	-0.002	0.20
400.0	399.6	399.1	0.3	-0.50	-0.002	0.22
Average Diff (%)						0.51



Calibrate by:

[Signature]

Approved by:

[Signature]

แก้ไขครั้งที่ : 00

วันที่แก้ไข : 02/06/23

สถานที่แก้ไข : QT-Q16-06

Thai Environmental Technic Limited 1/6 Soi Ramkhamhaeng 145 Khwaeng Zuthong Sanit Sungsang Bangkok 10240 Thailand
Tel : +66(0)2373-7799 (Auto) Fax : +66(0)2373-7799 • email: info@tet1995.com • www.tet1995.com



Thai Environmental Technic Limited
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Analyzer Calibration Report

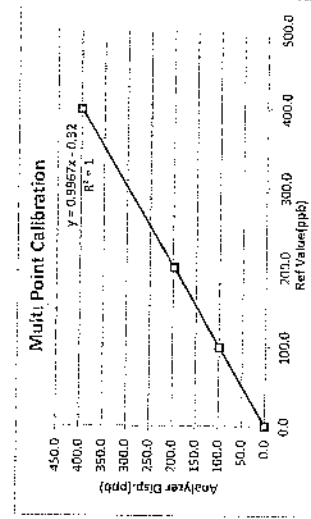
Calibrate Date : 10-May-23
Analyzer Type : NOx
Brand : API
Model : 200 E
Serial Number : 1732 (No. 5)
Range : 500 ppb
Temperature (°C) : 25.4
Barometer (mmHg) : 759.9
Humidity (50±15 %) : 50.04RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00962 SK

Calibration of Span

Supply Gas	Ref Value (ppb)	Before of Span (ppb)			After of Span (ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	1.8	1.5	0.3	0.2	0.2	0.0	0.2
Span	400.0	382.0	380.5	1.5	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value (ppb)	Analyzer Disp (ppb)			Output Difference		Abs (%) Diff
	NOx	NO	NO ₂	Diff (ppb)	% Diff	
0.0	0.4	0.2	0.2	0.20	0.001	0.05
100.0	99.8	99.2	0.6	-0.80	-0.008	0.80
200.0	199.6	198.2	1.4	-1.80	-0.009	0.90
400.0	399.0	398.8	0.2	-1.20	-0.003	0.30
Average Diff (%)						0.51



Calibrate by:

[Signature]

Approved by:

[Signature]

แก้ไขครั้งที่ : 00

วันที่แก้ไข : 02/06/23

สถานที่แก้ไข : QT-Q16-06

Thai Environmental Technic Limited 1/6 Soi Ramkhamhaeng 145 Khwaeng Zuthong Sanit Sungsang Bangkok 10240 Thailand
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Analyzer Calibration Report

Calibrate Date : 10-May-23
Analyzer Type : NOx
Brand : API
Model : 200 E
Serial Number : 393 (NO.13)
Range : 500 ppb

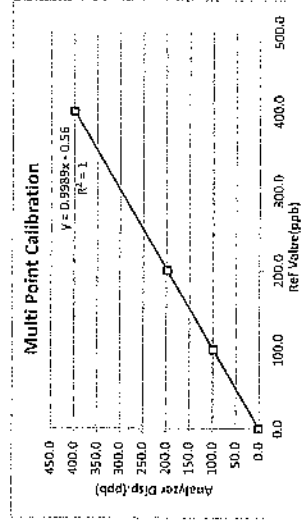
Temperature (°C) : 25 °C
Barometer (mmHg) : 759.9
Humidity (50±15 %) : 50.05RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00362.5K

Calibration of Span

Supply Gas	Ref Value (ppb)	Before of Span (ppb)			After of Span (ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	0.5	0.1	0.4	0.0	0.0	0.0	0.0
Span	400.0	387.0	384.0	3.0	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value (ppb)	Analyzer Disp. (ppb)			Output Difference	
	NOx	NO	NO ₂	Diff (ppb)	Abs (%) Diff
0.0	0.4	0.2	0.2	0.20	0.001
100.0	99.8	98.8	1.0	-1.20	-0.012
200.0	199.7	198.5	1.2	-1.50	-0.008
400.0	401.0	399.5	1.5	-0.50	-0.001
Average Diff (%)					0.53



Calibrate by: Y.S.

Approved by: Pigachon B

วันที่ตรวจ : 09

วันที่อนุมัติ : 02/09/15

การอนุมัติ : QP-QP16-06

Thai Environmental Technic Limited 1/6 Soi Ramkhamhaeng 145 Kwangkhut Saphan Sung Bangkok 10240 Thailand
Tel : +66(0)2373-7799 (Auto) Fax : +66(0)2373-7579 • admin@tet1995.com • www.tet1995.com



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

Calibrate Date : 12-May-23
Analyzer Type : NOx
Brand : Teledyne
Model : 200 E
Serial Number : 2759 (No.36)
Range : 500 ppb

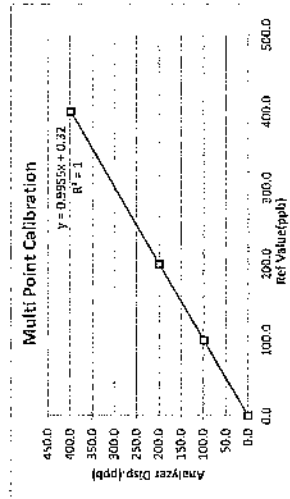
Temperature (°C) : 25 °C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.05RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00562.5K

Calibration of Span

Supply Gas	Ref Value (ppb)	Before of Span (ppb)			After of Span (ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	0.3	0.1	0.2	0.0	0.0	0.0	0.0
Span	400.0	387.0	382.0	5.0	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value (ppb)	Analyzer Disp. (ppb)			Output Difference	
	NOx	NO	NO ₂	Diff (ppb)	Abs (%) Diff
0.0	0.5	0.4	0.1	0.40	0.001
100.0	99.8	99.7	0.1	-0.30	-0.003
200.0	199.8	199.5	0.2	-0.50	-0.003
400.0	398.7	398.5	0.2	-1.50	-0.004
Average Diff (%)					0.36



Calibrate by: Y.S.

Approved by: Pigachon B

วันที่ตรวจ : 09

วันที่อนุมัติ : 02/09/15

การอนุมัติ : QP-QP16-06

Thai Environmental Technic Limited 1/6 Soi Ramkhamhaeng 145 Kwangkhut Saphan Sung Bangkok 10240 Thailand
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Thai Environmental Technic Limited
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Analyzer Calibration Report

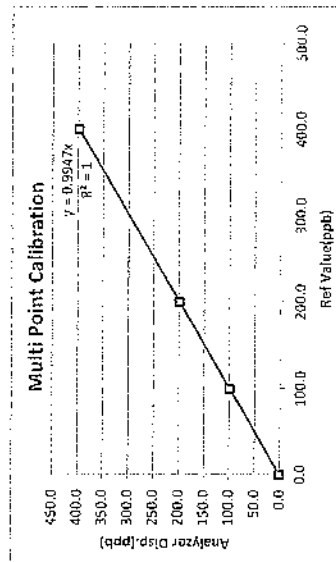
Calibrate Date	: 12-May-23	Temperature (°C)	: 25 °C
Analyzer Type	: SO ₂	Barometer (mmHg)	: 760.0
Brand	: Thermo	Humidity (50-15 %)	: 50.0 %RH
Model	: 43C	Dilutor	: API W700 S/N 625
Serial Number	: 43C-TL-67266366 (NO.9)	Zero Air	: API W701 S/N 1926
Range	: 500 ppb	Standard gas	: 118310

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span(ppb)	After of Span(ppb)	Abs% diff of Span
Zero	0.0	1.8	0.0	0.0
Span	400.0	386.0	400.0	0.0

Multi Point Calibration

Ref Value (ppb)	Analyzer Disp. (ppb)	Output Difference		
		Diff (ppb)	Percent Diff	Abs Percent Diff
0.0	0.4	0.4	0.00	0.00
100.0	99.1	-0.9	-0.01	0.90
200.0	198.7	-1.3	-0.01	0.65
400.0	398.1	-1.9	0.00	0.47
Average Diff (%)				0.53



Calibrate by

Approved by: Project B

090 : 45414111

ผู้เขียนมีใจ

เลขที่แบบฟอร์ม : OF-OP/6-06

Thai Environmental Technology Limited 1/6 Soi Ramkhamhaeng 245 Khwaeng/Kiet Saphan Surti Bangkok 10240 Thailand
• Tel : +66(0)2373-7799(Auto) Fax : +66(0)2373-7979 • tjtech@teli.net • www.teli.net

Certificate Of Analysis
Special Gases Mixture

Customer Details	
Name:	Thai Environmental Technic Ltd.
Address:	1/6 Soi Ramchamlarin 45, Saithansong, Saphanong, Bangkok 10740
Customer Tag No.:	

Certificate Details			
Number	Date of Issue	Expiry Date	Issue Date
3367/19	19-Sep-2019	18-Sep-2023	
Material Details			
Material Code:	608005-SK-41	Cylinder No.:	118310
Production Order:	145 01 Jan	Valve:	CGA 640 SS
Gas content:	5.520 M ³		40.0 L
Cylinder Owner:			
LIND:	Spectro scal	Cylinder Size:	
Laboratory Report			

Analysis

Component	Normal Concentration	Analysis Result ¹	Uncertainty ²	Method of Analysis ³	Assay Date
Sulphur Dioxide	40.0 ppm	4 ± 4 ppm	± 1% relative	(6) I-PB.352	10-Sep & 19-Sep-19
Nitrogen					

Reference Standard	Reference Standard used in Assay	Concentration	Expiry date
Sulphur Dioxide	Cylinder number	25.50±0.25 ppm	7-Mar-2023

7-Mar-2023
expiry date

Instrument/Make/Model	Analytical Instruments used in Assay	Last Multipoint Calibration
FTIR Spectrometers Nicolet 1550	Analytical Principle	10-Sep-2019
	FTIR-502	

10-Sep-2019
Last Requisition & Estimation

Recommend usage condition:

5% of actual content or before expire date whichever comes first.
Keep in well ventilation and secure area.

Comments

When reordering, please quote the material number

Note:

[illegible]

Page 1 of 1
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[illegible]



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

Calibrate Date : 10-May-23
Analyzer Type : SO₂
Brand : API
Model : 100B
Serial Number : 2658 (No. 18)
Range : 500 ppb

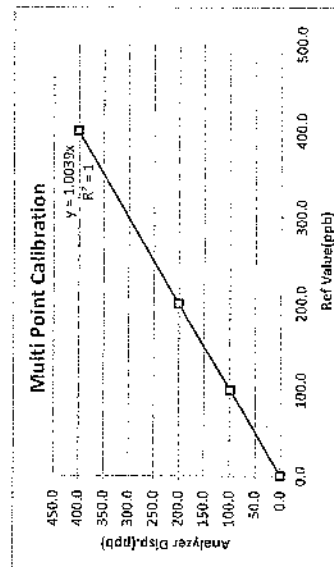
Temperature (°C) : 25°C
Barometer (mmHg) : 755.0
Humidity (50±15 %) : 50.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 118310

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span(ppb)	After of Span(ppb)	Abs% diff of Span
Zero	0.0	0.8	0.0	0.0
Span	400.0	394.0	400.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)	Output Difference		
		Diff (ppb)	Percent Diff	Abs Percent Diff
0.0	0.4	0.4	0.00	0.10
100.0	99.5	-0.5	-0.01	0.50
200.0	201.3	1.3	0.01	0.65
400.0	401.5	1.5	0.00	0.38
Average Diff (%)		0.41		



Calibrate by: gdr.s.
Approved by: Piyachon B.

แก้ไขครั้งที่ : 00 วันที่อนุมัติ : 02/09/13 เลขที่เอกสารรับ : QF-QP16-06

Thai Environmental Technic Limited 1/6 Soi Ramkhamhaeng 145 Khwaeng/Khet Saphan Sung Bangkok 10240 Thailand
Tel : +66(0)2373-7799(Auto) Fax : +66(0)2373-7970 • admin@et1995.com • www.et1995.com



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

Calibrate Date : 11-May-23
Analyzer Type : SO₂
Brand : Teledyne
Model : TMC-50
Serial Number : S02870 (No. 19)
Range : 500 ppb

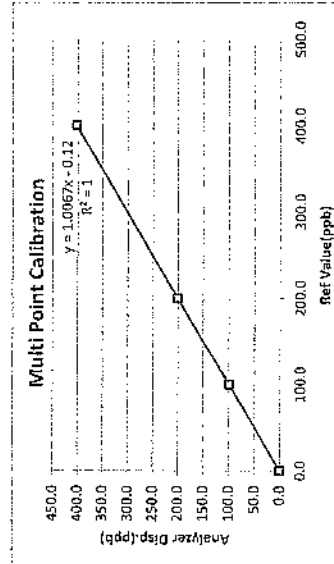
Temperature (°C) : 25°C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 118310

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span(ppb)	After of Span(ppb)	Abs% diff of Span
Zero	0.0	2.5	0.0	0.0
Span	400.0	394.0	400.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)	Output Difference		
		Diff (ppb)	Percent Diff	Abs Percent Diff
0.0	0.4	0.4	0.00	0.10
100.0	99.8	-0.2	0.00	0.20
200.0	201.3	1.3	0.01	0.65
400.0	402.7	2.7	0.01	0.67
Average Diff (%)		0.41		



Calibrate by: gdr.s.
Approved by: Piyachon B.

แก้ไขครั้งที่ : 00 วันที่อนุมัติ : 02/09/13 เลขที่เอกสารรับ : QF-QP16-06

Thai Environmental Technic Limited 1/6 Soi Ramkhamhaeng 145 Khwaeng/Khet Saphan Sung Bangkok 10240 Thailand
Tel : +66(0)2373-7799(Auto) Fax : +66(0)2373-7970 • admin@et1995.com • www.et1995.com



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

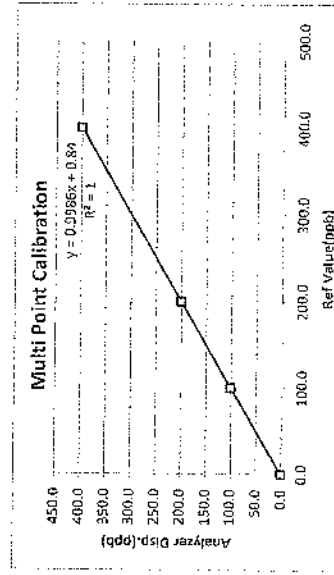
Calibrate Date : 11-May-23
Analyzer Type : SO₂
Brand : Teledyne
Model : 100 B
Serial Number : 1412 (No. 22)
Range : 500 ppm
Temperature (°C) : 25 °C
Barometer (mmHg) : 759.8
Humidity (50±15 %) : 50.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 118310

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span(ppb)	After of Span(ppb)	Abs% diff of Span
Zero	0.0	4.1	0.0	0.0
Span	400.0	415.0	400.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)	Output Difference	
		Diff (ppb)	Abs Percent Diff
0.0	0.4	0.4	0.10
100.0	101.2	1.2	0.01
200.0	200.7	0.7	0.00
400.0	400.1	0.1	0.00
Average Diff (%)		0.42	



Calibrate by: [Signature]
Approved by: Pigade B



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

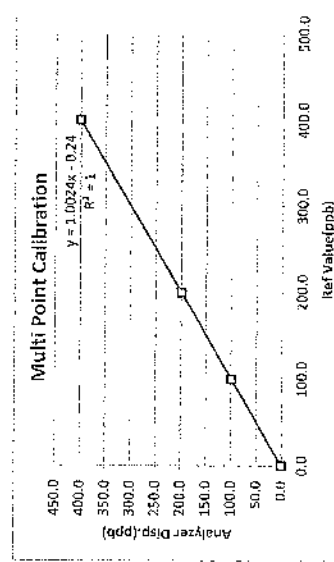
Calibrate Date : 16-May-23
Analyzer Type : SO₂
Brand : Teledyne
Model : 100 B
Serial Number : 062 (No. 23)
Range : 500 ppm
Temperature (°C) : 25 °C
Barometer (mmHg) : 758.2
Humidity (50±15 %) : 52.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 118310

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span(ppb)	After of Span(ppb)	Abs% diff of Span
Zero	0.0	0.8	0.0	0.0
Span	400.0	392.0	400.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)	Diff (ppb)	Output Difference	
			Percent Diff	Abs Percent Diff
0.0	0.4	0.4	0.00	0.10
100.0	99.7	-0.3	0.00	0.30
200.0	199.4	-0.6	0.00	0.30
400.0	401.2	1.2	0.00	0.30
Average Diff (%)		0.25		



Calibrate by: [Signature]
Approved by: Pigade B



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

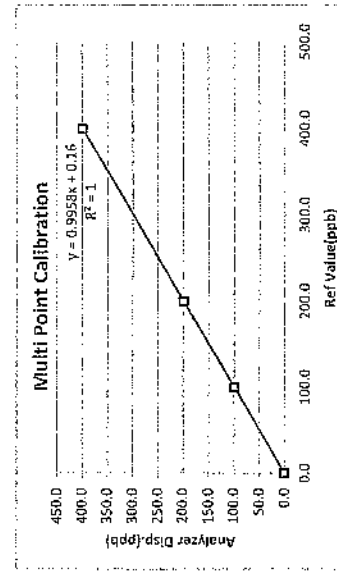
Calibrate Date : 10-May-23
Analyzer Type : SO₂
Brand : API
Model : 100E
Serial Number : 383 (No. 12)
Range : 500 ppb
Temperature (°C) : 25°C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 118310

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span(ppb)	After of Span(ppb)	Abs% diff of Span
Zero	0.0	2.3	0.0	0.0
Span	400.0	397.0	400.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)	Output Difference		
		Diff (ppb)	Percent Diff	Abs Percent Diff
0.0	0.4	0.4	0.00	0.10
100.0	99.7	-0.3	0.00	0.30
200.0	198.9	-1.1	-0.01	0.55
400.0	398.7	-1.3	0.00	0.33
Average Diff (%)		0.32		



Calibrate by: Ydhis

Approved by: Piyachon B

แก้ไขครั้งที่ : 00

วันที่อนุมัติ : 02/05/23

เลขที่อนุมัติ : QP-QP16-06



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

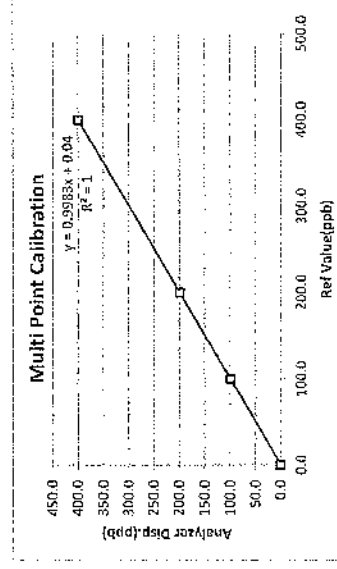
Calibrate Date : 10-May-23
Analyzer Type : SO₂
Brand : API
Model : 100A
Serial Number : 195 (No. 16)
Range : 500 ppb
Temperature (°C) : 25°C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 118310

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span(ppb)	After of Span(ppb)	Abs% diff of Span
Zero	0.0	2.1	0.0	0.0
Span	400.0	413.0	400.0	0.00

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)	Output Difference		
		Diff (ppb)	Percent Diff	Abs Percent Diff
0.0	0.4	0.4	0.00	0.10
100.0	99.8	-0.2	0.00	0.20
200.0	199.1	-0.9	0.00	0.45
400.0	399.7	-0.3	0.00	0.08
Average Diff (%)		0.21		



Calibrate by: Ydhis

Approved by: Piyachon B

แก้ไขครั้งที่ : 00

วันที่อนุมัติ : 02/05/23

เลขที่อนุมัติ : QP-QP16-06



CERTIFICATE OF ANALYSIS

Production Order Number: 90130879
Material Number: S33100-AL-44
Certification Date: 01-Sep-2015
Expiry Date: 01-Sep-2023

Analytical Result

Component	Requer Concentration	Certified Concentration	Certified Uncertainty	Method	Assay Date
Carbon Monoxide	80.0 ppm	80.9 ppm	± 1 % relative	(6) I-PL-352	31-Aug-2015
in Nitrogen					

Analysis

066475
Cylinder Number:
0834405

Reference	Cylinder No.	Concentration	Reference Standard used in Assay
1	1	100%	100%
2	2	100%	100%
3	3	100%	100%
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95	95	100%	100%
96	96	100%	100%
97	97	100%	100%
98	98	100%	100%
99	99	100%	100%

Appendix

Nothing impossible
\$900 Ayr
L50 Bar

[Signature]

Analytical Instruments used in assay

Digital Lab Exchange I/F Series

0.3-MIL

c. Other: I agree that, despite my original condition of this interview, I will respond to all of your questions completely.

THE UNIVERSITY OF CHICAGO

U.S. 241 9th St. W. • 55101-5001 • Minneapolis, MN

Cylinder Number D8Z4408
Production Order Number 99

Certification Date: 01-Sep-2013
Expiration Date: 01-Sep-2023

2. K^+ and Na^+

ผู้จัดทำ: สัมภาษณ์: ประจักษ์โกศลย์ จ้างัด (ประจักษ์โกศลย์)

Public Company Limited

[illegible]

0960-894X(200709)29:3;1-L

11:17:25.6 (00) e6j	021: -356 (55) 21	0:201 11:17:25.6 (00) e6j
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8359-0072 (ISSN) MALAYSIA
MALIS-0062 (POTENTIAL OF SUBSIDIARY)

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Volkswagen Leasing, 125 Liberty, Bridgeport, N.J. 07005-0000. Fax: 908/271-2700. E-mail: leasing@vw.com

ԼՍՀ-400 Տ. ԲՆԱԳՅԱՅԻՆԻԿ. Ա. ԼԱՐՇՆԱԿՆՈՂ. ՇՈՒՆԻԲԵՐԿՍՈ ԼԵՐԻՉ

ЭЛЕ-017.05 (79) 8-44111

150551 (66) 38.570-429 "49
150552 (66) 38.570-429 "49



CERTIFICATE OF ANALYSIS

Analytical Result			
Component	Request Concentration	Certified Concentration	Certified Uncertainty
Carbon Monoxide	40.0 ppm	41.1 ppm	± 1 % relative
In Nitrogen			(6) 1-PP-352
			31-Aug-2015

Reference Standard used In-Asay			
Cylinder No.	Concentration	Expiry Date	
1019905G	50.02 ± 0.25 ppm	26-Nov-2019	
Carbon Monoxide			
In Nitrogen			

Analytical Instruments used In-Asay			
Instrument Name/Model	Analytical Principle	Last Maintenance Calibration	
Dig LAB Excellence RTE Series	FTIR-CO	48-Aug-2015	

Method of Analysis	
1. Gas Chromatograph	
2. Paramagnetic Oxygen Analyzer	
3. Spectrophotometric Oxygen Analyzer	
4. Electrochemical Oxygen Analyzer	
5. Solid Electrolyte Fuel Cell	
6. Other specified	

Cylinder Number: IND24989	Certification Date: 01-Sep-2015
Production Order Number: 90130853	Expiration Date: 01-Sep-2023

[illegible]



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

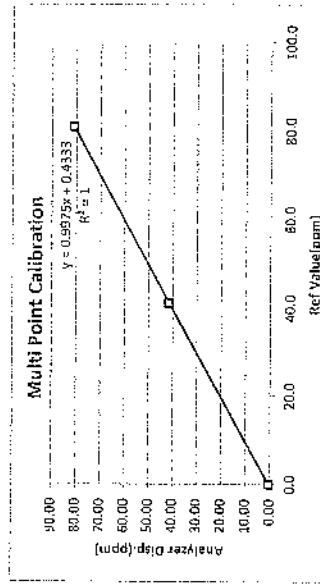
Calibrate Date : 12-May-23
Analyzer Type : CO
Brand : Horiba
Model : APWA 36CCE
Serial Number : 42088-7001 (NO. 1)
Range : 100 ppm
Temperature (°C) : 26°C
Barometer (mmHg) : 760
Humidity (50±15 %) : 50.0
Dilutor : API M700 S/N625
Zero Air : API M701 S/N1926
Standard gas : D824408, ND24989

Calibration of Span

Supply Gas	Ref Value (ppm)	Before of Span (ppm)	After of Span (ppm)	Abs% diff of Span
Zero	0.0	0.82	0.00	0.00
Span	80.9	82.00	80.90	0.00

Multi Point Calibration

Ref Value (ppm)	Analyzer Disp (ppm)	Output Difference	
		Diff (ppm)	Abs Percent Diff
0.0	0.40	0.4	0.49
41.1	41.50	0.4	0.97
80.9	81.10	0.2	0.25
Average Diff (%)			0.57



Calibrate by: Yus

Approved by: Piyasak B

แก้ไขครั้งที่ : 00

วันที่อนุมัติ : 02/09/23

แก้ไขแบบฟอร์ม : QF-Q116-06

Thai Environmental Technic Limited 116 Soi Ramthamlaeng 145 Khwaeng/Khet Saphan Song Bangkok 10240 Thailand
• Tel : +66(0)2373-7799(Auto) Fax : +66(0)2373-7799 • admin@tet1995.com • www.tet1995.com



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

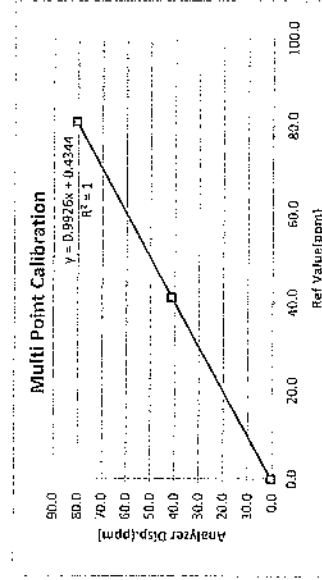
Calibrate Date : 12-May-23
Analyzer Type : CO
Brand : Tycoedyne
Model : 300E
Serial Number : 1066 (No. 2)
Range : 100 ppm
Temperature (°C) : 25°C
Barometer (mmHg) : 760
Humidity (50±15 %) : 50.0
Dilutor : API M700 S/N625
Zero Air : API M701 S/N1926
Standard gas : D824408, ND24989

Calibration of Span

Supply Gas	Ref Value (ppm)	Before of Span (ppm)	After of Span (ppm)	Abs% diff of Span
Zero	0.0	1.3	0.0	0.00
Span	80.9	83	80.9	0.00

Multi Point Calibration

Ref Value (ppm)	Analyzer Disp (ppm)	Diff (ppm)	Output Difference	
			Percent Diff	Abs Percent Diff
0.0	0.4	0.4	0.00	0.19
41.1	41.3	0.2	0.00	0.49
80.9	80.7	-0.2	0.00	0.25
Average Diff (%)				0.41



Calibrate by: Yus

Approved by: Piyasak B

แก้ไขครั้งที่ : 00

วันที่อนุมัติ : 03/09/23

แก้ไขแบบฟอร์ม : QF-Q116-06

Thai Environmental Technic Limited 116 Soi Ramthamlaeng 145 Khwaeng/Khet Saphan Song Bangkok 10240 Thailand
• Tel : +66(0)2373-7799(Auto) Fax : +66(0)2373-7799 • admin@tet1995.com • www.tet1995.com



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

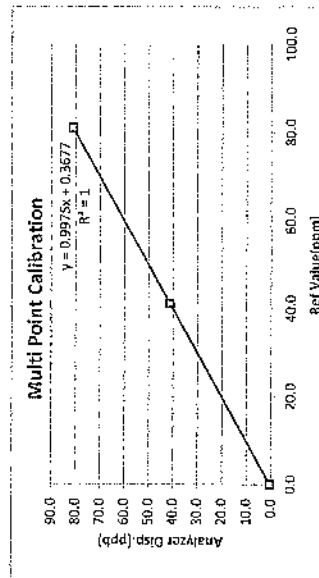
Calibrate Date	: 12-May-23	Temperature (°C)	: 26 °C
Analyzer Type	: CO	Burometer (mmHg)	: 760
Brand	: Thermo	Humidity (50±12 %)	: 50.0
Model	: 43C	Dilutor	: API M700 S/N6255
Serial Number	: 48642-846337 (No. 3)	Zero Air	: API M701 S/N1926
Rauc	: 400 ppm	Standard gas	: D92444 Gd, ND2-9989

Calibration of Span

Supply Gas	Ref Value(ppm)	Before of Span(ppm)	After of Span(ppm)	Abs% diff of Span
Zero	0.0	2.1	0.0	0.00
Span	80.9	83.4	80.9	0.00

Multi Point Calibration

Ref Value(ppm)	Analyzer Disp.(ppm)	Output Difference		
		Diff (ppm)	Percent Diff	Abs Percent Diff
0.0	0.4	0.4	0.00	0.49
41.1	41.3	0.2	0.00	0.49
80.9	81.1	0.2	0.00	0.25
Average Diff (%)			0.41	



Calibrate bv;

Approved by:

Pig. 13

แม่ไก่ไข่สด : ๕๐๐

วันที่ ๐๒/๐๙/๖๕

เลขที่แบบฟอร์ม : OF-CP 16.06

Thai Environmental Technic Limited 1/6 Soi Ramkhamhaeng 145 Kluayung/Khet Saphan Sung Bangkok 10240 Thailand
 Tel: +66(0)2373-7799(Auto) Fax: +66(0)2373-7979 • admin@ret1995.com • www.ret1995.com



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Personal Pump Calibration Report

Equipment Type	:	Personal Pump/Parameter
Equipment Range	:	0.1-7.0 U/min
Calibration Range	:	0.1-4.0 U/min
Calibration Type	:	Drycal
Calibration S/N	:	7182

[illegible]

Calibration Date 01 / 07 / 66

Calibration By *frnvd*

Remark : Uncertainty Type A = $\sigma = \frac{SD}{\sqrt{n}}$

SD
..

= Standard deviation

8

= Mean

-176-



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Equipment Type	:	Personal Pump/Parameter
Equipment Range	:	0.1-7.0 U/min
Calibration Range	:	3.1-4.0 U/min
Calibration Type	:	Drycal
Calibration S/N	:	109498

Calibration Date 02 / 08 / 99
Calibration By *fraga*

Remark : Uncertainty Type A = $\frac{\sigma}{\sqrt{n}}$ = SD



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Equipment Type	:	Personal Pump/Parameter
Equipment Range	:	0.1-7.0 l/min
Calibration Range	:	0.1-4.0 l/min
Calibration Type	:	Drycal
Calibration S/N	:	109698

Calibration Date 01 / 09 / 66
Calibration By *W. H. H. H.*

Remark : Uncertainty Type A = $\frac{\sigma}{\sqrt{n}}$ SD
: SD = Standard deviation
: \bar{X} = Mean



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Personal Pump Calibration Report

Equipment Type	:	Personal Pump/Parameter
Equipment Range	:	0.1-7.0 U/min
Calibration Range	:	0.1-4.0 U/min
Calibration Type	:	Drycal
Calibration S/N	:	109658

[illegible]

Calibration Date 30 / 09 / 66

Calibration By John

Remark : Uncertainty Type A = $\frac{\sigma}{\sqrt{n}}$ SD

SD = Standard deviation
 \bar{X} = Mean

-476-



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Personal Pump Calibration Report

Equipment Type	:	Personal Pump/Parameter
Equipment Range	:	0.1-7.0 l/min
Calibration Range	:	0.1-4.0 l/min
Calibration Type	:	Drycal
Calibration S/N	:	109698

[illegible]

Calibration Date 02 / 11 / 66

Calibration By g/nd

Remark : Uncertainty Type A = $\frac{\sigma}{\sqrt{n}}$ SD

: SD	= Standard deviation
: \bar{x}	= Mean

-575-



 TEL Thai Engineering & Technology Limited
(เจริญ เทคโนโลยีไทย จำกัด)

Methane-NMHC Analyzer

Calibration 5/N : 7182

Calibration By W. H. H. H.

1

$$\bar{x} = \text{Mean}$$

-66-

Environmental : Temperature 25.0°C Humidity 51 %RH

Test Results Table :

The calibration was performed following the triple point by Standard gas mixed Methane-Propane in Air at concentration 2, 20 and 200 ppm and verified by Standard gas mixed Methane-Propane in Air as following :

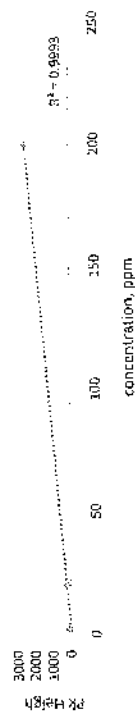
Calibration Check (Before adjust)					
Std. gas	Zero			Span	
	Reading (ppm)	Expected (ppm)	Drift (ppm)	Reading (ppm)	Expected (ppm)
Methane	0.0	0.0	0.0	2.26	2.0
	0.0	0.0	0.0	5.01	20.0
	0.0	0.0	0.0	200.65	200.0
NMHC	0.0	0.0	0.0	1.88	2.0
	0.0	0.0	0.0	20.89	20.0
	0.0	0.0	0.0	204.21	200.0

Calibration Check (After adjust)					
Std. gas	Zero			Span	
	Reading (ppm)	Expected (ppm)	Drift (ppm)	Reading (ppm)	Expected (ppm)
Methane	0.0	0.0	0.0	1.99	2.0
	0.0	0.0	0.0	20.08	20.0
	0.0	0.0	0.0	199.76	200.0
NMHC	0.0	0.0	0.0	1.99	2.0
	0.0	0.0	0.0	19.90	20.0
	0.0	0.0	0.0	200.02	200.0

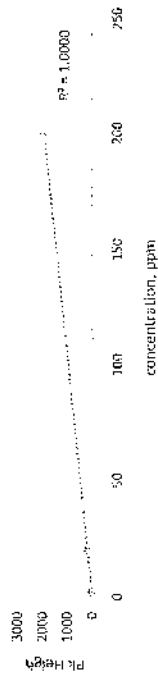
Linearity Check:

Conc (ppm)	Methane		Propane	
	Reading	Height	Reading	Height
2	1.99	76.22	1.99	17.74
20	20.08	248.64	19.90	186.44
200	199.76	2488.97	200.02	1919.60

Methane Response



Non-Methane Response



PM Operations by Tewapong Chueywatkoa
(Mr. Tewapong Chueywatkoa)

Approve by Phornip Phetshee
(Mrs. Phornip Phetshee)
Laboratory Manager

Scientist
PM Date 13 / 1 / 2023

Approve Date 13 / 01 / 2023

End of report



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
33/46 PATTANAKARN ROAD 501 IN, SUKUMVIT 11, SUKUMVIT 11, BANGKOK 10250
TEL: 0-2773-5006, 29 FAX: 0-2719-4184



Cert. No.: 23CHO641
Page: 1 of 2

Certificate of Calibration

Equipment: pH Meter
Manufacturer: Horiba
Model: F-71G
Serial No.: V381F8H3
ID No.: Ine-LAB-025
Condition As-Received:
Received Date: 31 October 2023
Calibration Date: 31 October 2023
Reference: 2310-08/3OC-1
Submitted by: Thai Environmental Technic Limited
1/6 Soi Ramkhamhaeng 145,
Khwang/Khet Saphan Sung,
Bangkok 10240

Calibration Place:
Ambient Temperature: (25.8 ~ 24.6) °C
Relative Humidity: (69.3 ~ 65.6) %
Calibration Procedure:
In-house method:
- CP-0CH2 by direct measurement with standard voltage calibrator and direct measurement with certified reference material (CRM)

Calibrated by: Kha Ruitanapapachai

Approved by: 
() Salhip Meangmai
() Warakorn Lerngagtrakul
() Ponpan Palpin

Issue Date: 10 November 2023

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Corporate Services, Technology Promotion Association and Testing Services

A 0060437



Cert. No.: 23CHO641
Page: 2 of 2

Condition of this calibration result

1. Reference Standard Instrument :
Instrument Serial No. ID No. Cert. No. Due Date
1) Document Process Calibrator 43180066 130RC092 23E1284 10 Apr 2024
2) Digital Thermometer 130RC018 23T1595 13 Sep 2024
This certificate is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. A18-1835

Buffer Solution Manufacturer Lot No. Exp. date
pH 4.008 CPA chem 931958 01 Oct 2025
pH 6.865 CPA chem 788986 01 Jan 2024
pH 9.181 CPA chem 931860 01 Oct 2024

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

Calibration Results

Function : mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
			mV	pH		
pH Meter S/N: V3B1F8H3	4.000	177.48	177.5	4.000	0.058	2.00
	6.860	8.28	8.3	6.860	0.058	2.00
	7.000	0.00	0.0	7.000	0.058	2.00
	9.180	-128.97	-128.9	9.180	0.058	2.00
	10.000	-177.48	-177.4	10.000	0.058	2.00

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,9)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading		Uncertainty of pH measurement (\pm)	Coverage factor k
		pH	mV		
pH Electrode S/N: 9X2E0223	4.008	4.031	180.0	0.0082	2.00
	6.865	6.870	-7.4	0.0087	2.00
	9.181	9.186	-142.0	0.014	2.00

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

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a 1188742



Equipment: ROD Incubator
Condition As-Received: Used Item
Reference: 2304-01480C-2
Result of Calibration:-
Function of UUC*: (*) Without Adjustment
Fresh air setting: Not Available

Cert.No.: 23TME73
Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	19.8	19.7	0.54	0.37	1.3	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	20.121	20.227	19.983	20.098	19.992	19.953	19.936	19.914	20.048	0.72

Average*: The average of 30 values in each position.
Temperature stability: One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature uniformity: The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Overall Variation: The Difference of the maximum and minimum measured temperatures throughout observation.
UUC*: Unit Under Calibration

Note: The reported uncertainty of measurement was included stability and excluded uniformity.

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PATTANAKARN ROAD SOI 19, SUKHARUANG, SUKHARUANG BANGKOK 10250
TEL: 0-23717-3006/39 FAX: 0-23719-9454



Cert.No.: 23CHO493
Page: 1 of 3

Certificate of Calibration

Equipment: Spectrophotometer
Manufacturer: Perkin Elmer
Model: Lambda 365
Serial No.: 365K3042909
ID No.:
Condition As-Received: Used Item
Received Date: 18 August 2023
Calibration Date: 18 August 2023
References: 2308-04680C-1
Submitted by: Thai Environmental Technic Limited
1/6 Soi Ramkhamhaeng 145,
Khwaeng/Khet Saphan Sung,
Bangkok 10240
Laboratory (Thai Environment Technic Limited)
{ 25.5 - 25.3 } °C (On-Site)
{ 57.8 - 60.6 } % (On-Site)
In - house method :
CP-OCH4 based on ASTM E 275-01

Calibrated by: Kunchit Promprat

Approved by: 
Approved Signatory

{✓} Sathip Meangmai
{ } Warakorn Lenggastrakul
{ } Ponpan Paipim

Issue Date: 22 August 2023

The Uncertainties are for a confidence probability of approximately 95 %

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Approval of the head of Corporate Services & Equipment Calibration and Testing Services.

a 1158204

A 0057186



Cert. No. : 23CHO493

Page : 2 of 3

Condition of calibration result

1. Reference Standard Material :

Material	Serial No.	Certificate No.	Due date
1. Absorbance Standard set	8331	105939	28 Sep 2024
2. Wavelength Standard set	8417	100498	25 Mar 2024
3. Wavelength Standard set	8418	100499	25 Mar 2024
4. Stray Light Standard set	8419	108963	01 Feb 2025

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

3. This certificate is traceable to the International System of Unit maintained through :

- Sterna Scientific Ltd.

4. Spectral Bandwidth : 1 nm

Scan Speed : 30 nm/min

Calibration Results : without adjustment

Wavelength Accuracy

Certified Values of Reference Material (nm)	UUC Reading (nm)	Uncertainty of Measurement (\pm nm)	Coverage Factor k
418.53	418.54	0.12	2.00
536.52	536.13	0.12	2.00
636.00	637.64	0.14	2.05
684.50	684.48	0.13	2.00
878.41	879.42	0.12	2.00

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Cert. No. : 23CHO493

Page : 3 of 3

Calibration Results : without adjustment

Photometric Accuracy

Wavelength (nm)	Certified Values of Reference Material (Abs)	UUC Reading (Abs)	Uncertainty of Measurement (\pm Abs)	Coverage Factor k
420.0	Zero 0.5712 0.7510 1.0893	0.0000 0.5699 0.7494 1.0877	0.0028 0.0031 0.0031 0.0033	2.00 2.00 2.00 2.00
548.1	Zero 0.5224 0.6856 0.9937	-0.0001 0.5209 0.6839 0.9921	0.0028 0.0028 0.0028 0.0028	2.00 2.00 2.00 2.00
685.0	Zero 0.5387 0.6832 0.9886	-0.0001 0.5375 0.6810 0.9861	0.0028 0.0028 0.0023 0.0028	2.00 2.00 2.00 2.00

Stray Light

* Straylight at 260.74 nm \pm 0.11 nm	Reading at 260.74 nm \pm 0.11 nm
Abs	2.0488
%T	0.8951

Remark

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer

- The Potassium Dichromate filled cells are measured against a Perchloric acid blank.

- Cut-off wavelength of stray light reference material (Potassium Iodide) at wavelength

- Result = Pass, if Absorbance > 2.00 Abs and Transmission < 1.0 %T at Wavelength

- * : Not NSC-ONSC Accredited

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

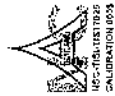
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Satish

1176585



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-2000-29 FAX. 0-2719-9464



Cert. No.: 23TM604
Page: 1 of 3

Certificate of Calibration

Equipment : Incubator
Manufacturer : Memmert
Model : INE 500
Serial No. : E505.0595
ID No. : TET.LAB.INC 01

Submitted by : Thai Environmental Technic Limited
1/6 Soi Ramkhamhaeng 145,
Khwaeng/Khet Saphan Sung,
Bangkok 10240

Location : Laboratory (Thai Environmental Technic Limited)

Received Order : 10 April 2023
Calibration Date : 10 April 2023
Ambient Temperature : $(20 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$

Calibrated by : Man Pattanasongpalboon

Approved by :
Approved Signatory

() Ponthippa Tameyakul
(x) Malee Buckrua
() Suwit Injal

Issue Date : 25 April 2023

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the Issuer of Corporate Services & Equipment Calibration and Testing Services.

A 0053457



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-01480C-4
Procedure Used :-

Calibration were conducted using calibration procedure CP-OT02 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD)

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument Model Serial No. Cert. No. Due Date

1) Data Acquisition 34970A MY41021843 22LM172 27 Dec 2023

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

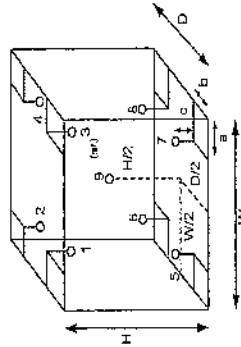
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL.Humid. (%)	54	57
AC Supply (Volt)	223	219



Probe Installation Details :

a = 5.0 cm
b = 5.0 cm
c = 5.0 cm
Dimension of Chamber :
D = 0.40 m
W = 0.56 m
H = 0.48 m
Capacity = 0.11 m³

Position :	Ref. Std. ID No.:
1	18-04RTD-01
2	18-04RTD-02
3	18-04RTD-03
4	18-04RTD-04
5	18-04RTD-05
6	18-04RTD-06
7	18-04RTD-07
8	18-04RTD-08
9 (ref)	18-04RTD-09

A 1158197



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-0146OC-4
Result of Calibration : (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 23TMB04
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k	Measured Temperature (°C)									Uncertainty (°C)
							Position									
							1	2	3	4	5	6	7	8	9 (ref.)	
35.0	35.0	35.0	0.065	0.32	0.67	2	34.870	34.847	34.722	34.880	34.744	35.047	34.842	35.288	35.026	0.30
41.5	41.5	41.5	0.032	0.40	0.63	2	41.625	41.612	41.461	41.733	41.300	41.428	41.416	41.874	41.758	0.30
44.5	44.5	44.5	0.088	0.60	0.86	2	44.744	44.708	44.553	44.862	44.205	44.476	44.352	44.931	44.778	0.30

Average* : The average of 30 values in each position.
Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.
Temperature uniformity : The maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady-state conditions.
Overall Variation : The Difference of the maximum and minimum measured temperatures throughout observation.
UUC* : Unit Under Calibration
Note : The reported uncertainty of measurement was included stability and excluded uniformity.

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

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11/11/2023

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33-TISTR



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0197

MTC No. EEL, BP. 606166

CALIBRATION CERTIFICATE

Submitted by : THAI ENVIRONMENTAL TECHNIC LIMITED
Address : 1/6 Soi Rantkhamhaeng 145, Khwaeng/Khet Saphanlung, Bangkok 10240.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre,
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Calibrator
Manufacturer : Temmans
Model : TM-100
Serial No. : 181203570
Ambient Environment
Temperature : (23 ± 3) °C
Relative Humidity : (50 ± 15) %
Ambient Pressure : (101.325 ± 1.500) kPa

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

2. Measuring Amplifier Brüel&Kjær 2636 S/N 1337484.

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

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

5. Pressure Transducer Vaisala PTB202AD S/N 70650001.

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

7. Condenser Microphone Brüel&Kjær 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 : 10 Jan. 2023

Date of Calibration : 16 Jan. 2023

1/3

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

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

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FA/BL-MTC-002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0197

MTC No. EEL. BP. 60/0166

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

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

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

1. Sound Pressure Level

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

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Brüel&Kjær 4180	989.3	-10.7	± 1.5	$\pm 2.0\%$

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Brüel&Kjær 4180	2.20	± 0.50	$\pm 4.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Date of Calibration : 16 Jan. 2023

2 / 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.

FMEL/MTC.002 Rev.4

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Fax. (66) 0 2377 5009
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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0197

MTC No. EEL. BP. 60/0166

Nominal Output of Unit Under Test = 114 dB re 20 μ Pa at 1000 Hz

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Brüel&Kjær 4180	113.96	-0.04	± 0.10	± 0.75 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Brüel&Kjær 4180	985.1	-14.9	± 1.5	$\pm 2.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Brüel&Kjær 4180	2.60	± 0.60	$\pm 4.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Signature)
(Mr. Weerachai Deechaiyee)

Approved by :



Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 16 Jan. 2023

Date of Issue : 18 Jan. 2023

Ref : 2011266011000062001

End of Certificate

3 / 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.

FMEL/MTC.002 Rev.4

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Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type : Sound Level Meter
Calibrator : TENMARS Sound Calibrator TM-100
Standard : IEC 60942
Accuracy : 94.0 ±0.3 dB and 114.0 ±0.5 dB
Frequency : at 1,000 Hz ±1%
Calibrator Serial NO. : 181203370

Calibration Date : 24-June-2023
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23±3)°C : 25 °C
Relative Humidity(50±15 % : 45.0 % RH
Dued Date of Calibrate : 31-July-2023

Item	Instrument Calibrated		Reference Acoustic dB	Before Adjust			After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3			
18	ACO	6226	070048	94.1	94.1	94.1	94.0	0.1	PASS
				114.1	114.1	114.1	114.0		
19	ACO	6226	070047	93.9	93.9	93.9	94.0	0.1	PASS
				113.9	113.9	113.9	114.0		
20	ACO	6226	070048	94.2	94.2	94.2	94.0	0.2	PASS
				114.1	114.1	114.1	114.1		
21	ACO	6226	070049	93.8	93.8	93.8	94.0	0.2	PASS
				113.7	113.7	113.7	113.7		
23	RION	NL-21	00487676	94.2	94.2	94.2	94.0	0.2	PASS
				114.1	114.1	114.1	114.1		
25	ACO	6226	100068	94.3	94.3	94.3	94.0	0.3	PASS
				114.3	114.3	114.3	114.3		
26	ACO	6226	100099	94.1	94.1	94.1	94.0	0.1	PASS
				114.2	114.2	114.2	114.2		
28	ACO	6225	100101	93.9	93.9	93.9	94.0	0.1	PASS
				113.8	113.8	113.8	113.8		
29	ACO	6226	100102	94.3	94.3	94.3	94.0	0.3	PASS
				114.2	114.2	114.2	114.2		
30	ACO	6226	100166	94.2	94.2	94.2	94.0	0.2	PASS
				114.1	114.1	114.1	114.1		

Calibration By :

Approve by : Prayut M.



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type : Sound Level Meter
Calibrator : TENMARS Sound Calibrator TM-100
Standard : IEC 60942
Accuracy : 94.0 ±0.3 dB and 114.0 ±0.5 dB
Frequency : at 1,000 Hz ±1%
Calibrator Serial NO. : 181203370

Calibration Date : 24-June-2023
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23±3)°C : 25 °C
Relative Humidity(50±15 % : 45.0 % RH
Dued Date of Calibrate : 31-July-2023

Item	Instrument Calibrated		Reference Acoustic dB	Before Adjust			After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3			
51	ACO	6236	182077	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0		
52	ACO	6226	180142	93.9	93.9	93.9	94.0	0.1	PASS
				113.9	113.9	113.9	113.9		
53	ACO	6226	180095	93.9	93.9	93.9	94.0	0.1	PASS
				113.9	113.9	113.9	113.9		
54	ACO	6226	180096	93.9	93.9	93.9	94.0	0.1	PASS
				113.9	113.9	113.9	113.9		
55	ACO	6226	180097	93.9	93.9	93.9	94.0	0.1	PASS
				113.9	113.9	113.9	113.9		
56	ACO	6226	180098	94.1	94.1	94.1	94.0	0.1	PASS
				114.0	114.0	114.0	114.0		
57	ACO	6226	180099	93.8	93.8	93.8	94.0	0.2	PASS
				113.7	113.7	113.7	113.7		
58	ACO	6226	180143	93.9	93.9	93.9	94.0	0.1	PASS
				113.8	113.8	113.8	113.8		
59	ACO	6226	180203	94.1	94.1	94.1	94.0	0.1	PASS
				113.9	113.9	113.9	113.9		
60	ACO	6226	180204	94.3	94.3	94.3	94.0	0.3	PASS
				114.2	114.2	114.2	114.2		

Calibration By :

Approve by : Prayut M.



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type : Sound Level Meter
Calibrator : TENMARS Sound Calibrator TM-100
Standard : IEC 60942
Accuracy : ± 0.3 dB and ± 1.0 dB
Frequency : at 1,000 Hz $\pm 1\%$
Calibrator Serial NO. : 181203570

Calibration Date : 24-June-2023
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23 \pm 3) $^{\circ}$ C : 25 $^{\circ}$ C
Relative Humidity (50 \pm 5) % : 45.0 % RH
Dried Date of Calibrate : 31-July-2023

Item	Instrument Calibrated		Reference Acoustic dB	Before Adjust			After Adjust \pm dB	Deviation \pm dB	Result Calibrate
	Brand	Model		กัวงตี้ 1	กัวงตี้ 2	กัวงตี้ 3			
61	ACO	6226	160205	94.0	94.0	94.0	94.0	0.0	PASS
62	ACO	6226	160211	94.0	94.0	94.0	94.0	0.0	PASS
63	ACO	6226	160212	94.0	94.1	94.1	94.0	0.1	PASS
64	ACO	6226	160213	94.0	94.1	94.1	94.0	0.1	PASS
65	ACO	6226	160215	94.0	93.7	93.7	94.0	0.3	PASS
67	ACO	6226	160216	94.0	94.1	94.1	94.0	0.1	PASS
68	ACO	6236	222038	94.0	93.9	93.9	94.0	0.1	PASS
69	ACO	6236	222037	94.0	94.1	94.1	94.0	0.1	PASS
70	ACO	6236	222038	94.0	94.1	94.1	94.0	0.1	PASS
71	ACO	6236	222039	94.0	94.0	94.0	94.0	0.0	PASS
72	ACO	6236	222040	94.0	94.0	94.0	94.0	0.0	PASS

Calibration By :

Approve by :



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type : Sound Level Meter
Calibrator : TENMARS Sound Calibrator TM-100
Standard : IEC 60942
Accuracy : ± 0.3 dB and ± 1.0 dB
Frequency : at 1,000 Hz $\pm 1\%$
Calibrator Serial NO. : 181203570

Calibration Date : 24-June-2023
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23 \pm 3) $^{\circ}$ C : 25 $^{\circ}$ C
Relative Humidity (50 \pm 5) % : 45.0 % RH
Dried Date of Calibrate : 31-July-2023

Item	Instrument Calibrated		Reference Acoustic dB	Before Adjust			After Adjust \pm dB	Deviation \pm dB	Result Calibrate
	Brand	Model		กัวงตี้ 1	กัวงตี้ 2	กัวงตี้ 3			
18	ACO	6226	070046	94.0	94.1	94.1	94.0	0.1	PASS
19	ACO	6226	070047	94.0	93.9	93.9	94.0	0.1	PASS
20	ACO	6226	070048	94.0	94.2	94.2	94.0	0.2	PASS
21	ACO	6226	070049	94.0	93.8	93.8	94.0	0.2	PASS
23	RCGN	NL-21	00487676	94.0	94.2	94.2	94.0	0.2	PASS
25	ACO	6226	100058	94.0	94.3	94.3	94.0	0.3	PASS
26	ACO	6226	100059	94.0	94.1	94.1	94.0	0.1	PASS
28	ACO	6226	100101	94.0	93.9	93.9	94.0	0.1	PASS
29	ACO	6226	100102	94.0	94.3	94.3	94.0	0.3	PASS
30	ACO	6226	100106	94.0	94.2	94.2	94.0	0.2	PASS

Calibration By :

Approve by :



Certificate of Calibration

Certificate Number : SPR23010143-4
 Page : 1 of 4

Customer : Thai Environmental Technic Limited.
 1/6 Soi Ramkhamhaeng 145, Khwaeng Saphan Sung, Khet Saphan
 Sung, Bangkok 10240, Thailand.


Equipment Name	: Vibration
Manufacturer	: Instantel
Model	: Micromate
Serial Number	: UM15905
ID. Number	: No.12
Environmental Conditions	
Ambient Temperature	: $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$
Relative Humidity	: $50\% \pm 15\%$
Location of Calibration	: In-Lab
Calibration Procedure	: In-House Method
	Received Date : 13 Jan 2023
	Calibration Date : 17 Jan 2023
	Recommend Due Date : 17 Jan 2024
	Date of Issue : 18 Jan 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 SF Metrology System (Thailand).

Calibrated by : Mr. Munin Khumpum
 Calibration Officer

Approved by : 
 (Ms. Bussakorn Chaikaew)
 Authorized Signatory



Calibration Report

Certificate Number : SPR23010143-4
 Page : 2 of 4

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Vibration Calibrator	VC-02	2007014	AV-0080-20	10 Dec 2023

Traceability

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



Result of Calibration

Certificate No. : SPR23010143-4 Page : 4 of 4

Results of Calibration : (+) Without (-) Ailer Adjustment

Linearity Performance Test			Unit : m/s ²	
Frequency (Hz)	STD Reading	UUC Reading	Error	Uncertainty (±)
150.0	0.502	0.506	0.004	0.0060
160.0	1.003	1.010	0.007	0.012
150.0	1.501	1.513	0.012	0.017
160.0	2.004	2.016	0.012	0.023
160.0	3.005	3.022	0.017	0.035
160.0	5.007	5.027	0.020	0.058

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% the standard uncertainty with the coverage factor $k = 2$.

- End of Certificate -

- End of Certificate -



Result of Calibration

Certificate No. : SPR23010143-4 Page : 3 of 4

Results of Calibration : (✓) Without () After Adjustment

Function	STD Reading	UUC Reading	Error	Uncertainty (±)
Velocity (mm/s)	5.003	5.016	0.013	0.059

Frequency Response Performance Test @ 5 mm/s
Unit : mm/s

Frequency (Hz)	STD Reading	UUC Reading	Error	Uncertainty (\pm)
10.0	5.004	5.025	0.021	0.058
20.0	5.002	5.022	0.020	0.058
50.0	5.003	5.020	0.017	0.058
80.0	5.001	5.018	0.017	0.058
100.0	5.003	5.013	0.010	0.058
160.0	5.001	5.017	0.016	0.058
200.0	5.003	5.021	0.018	0.058



Certificate of Calibration


Certificate Number : SPR23010143-2 Page : 1 of 4

Customer : Thai Environmental Technic Limited.
1/8 Soi Ramkhamhaeng 145, Khtwaeng Saphan Sung, Khet Saphan Sung, Bangkok 10240, Thailand.

Equipment Name	: Vibration
Manufacturer	: Insantel
Model	: Micromate
Serial Number	: UM16047
ID Number	: No.14
Environmental Conditions	
Ambient Temperature	: 23 °C ± 3 °C Received Date : 13 Jan 2023
Relative Humidity	: 50 % ± 15 % Calibration Date : 17 Jan 2023
Location of Calibration	: In-Lab Recommend Due Date : 17 Jan 2024
Calibration Procedure	: In-House Method Date of Issue : 18 Jan 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.Munin Khumpum Approved by : 
Calibration Officer (Ms.Bussakorn Chaikaew)
Authorized Signatory



Calibration Report

Certificate Number : SPR23010143-2 Page : 2 of 4

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due Date
Vibration Calibrator	VC-02	2007014	AV-Q050-20	10 Dec 2023

Traceability

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



Result of Calibration

Certificate No. :

SPR23010743-2

Page : 3 of 4

Results of Calibration : (+) Without () After Adjustment

Geophone 2/N 721A3301 Functional Performance Test @160Hz

Function	STD Reading	UUC Reading	Error	Uncertainty (\pm)
Velocity (mm/s)	5.004	4.983	-0.016	0.059

Frequency Response Performance Test @ 5 mm/s					Unit : mm/s				
Frequency (Hz)	STD Reading	UUC Reading	Error	Uncertainty (\pm)	Frequency (Hz)	STD Reading	UUC Reading	Error	Uncertainty (\pm)
10.0	5.025	4.989	-0.036	0.058	10.0	5.025	4.989	-0.036	0.058
20.0	5.022	4.987	-0.035	0.058	20.0	5.022	4.987	-0.035	0.058
50.0	5.019	4.985	-0.034	0.058	50.0	5.019	4.985	-0.034	0.058
80.0	5.014	4.985	-0.029	0.058	80.0	5.014	4.985	-0.029	0.058
100.0	5.005	4.987	-0.018	0.058	100.0	5.005	4.987	-0.018	0.058
160.0	5.011	4.984	-0.027	0.058	160.0	5.011	4.984	-0.027	0.058
200.0	5.016	4.980	-0.036	0.058	200.0	5.016	4.980	-0.036	0.058



Result of Calibration

Certificate No. : SPR23010143-2

Page : 4 of 4

Results of Calibration : (+) Without () After Adjustment

Linearity Performance Test

Frequency (Hz)	STD Reading	UUC Reading	Error	Uncertainty (\pm)
160.0	0.501	0.511	0.010	0.0060
180.0	1.001	1.013	0.012	0.012
160.0	1.503	1.490	-0.013	0.017
160.0	2.004	1.983	-0.021	0.023
160.0	3.014	2.982	-0.032	0.035
160.0	5.017	4.983	-0.034	0.058

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 -



Certificate of Calibration

Certificate Number : SPR23102420-1 Page : 1 of 3
Customer : Thai Environmental Technic Limited.
1/6 Soi Ramkhamhaeng 145, Khwaeng Saphan Sung, Khet Saphan
Sung, Bangkok 10240, Thailand.

Equipment Name : Vibration Meter
Manufacturer : InstanTel
Model : 721A2501721A2901
Serial Number : UM10831
ID. Number : No.06
Environmental Conditions
Ambient Temperature : 23 °C ± 3 °C Received Date : 27 Oct 2023
Relative Humidity : 50 % ± 15 % Calibration Date : 30 Oct 2023
Location of Calibration : In-Lab Recommend Due Date : 30 Oct 2024
Calibration Procedure : In-House Method Date of Issue : 31 Oct 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 institutes, 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.

The calibration certificate shall not be reproduced except in full without written approval of SP Metrology System (Thailand).

Calibrated by : Mr. Munin Khunpurn Approved by : 
Calibration Officer (Mr. Nirut Loha)
Authorized Signatory



Calibration Report

Certificate Number : SPR23100420-1 Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Vibration Calibrator	VC-02	2007014	AV-0048-23	13 Aug 2024

Traceability

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



Result of Calibration

Certificate No. : SPR23100420-1

Page : 3 of 3

Frequency Response Performance Test @ 1 mm/s

Frequency (Hz)	STD Reading	UUC Reading	Error	Uncertainty (±)
20.0	1.002	1.035	0.033	0.042
40.0	1.002	1.031	0.029	0.042
50.0	1.001	1.028	0.027	0.042
80.0	1.003	1.024	0.021	0.042
100.0	1.004	1.026	0.022	0.042
150.0	1.006	1.029	0.023	0.042
200.0	1.007	1.030	0.023	0.042

Linearity Performance Test

Frequency (Hz)	STD Reading	UUC Reading	Error	Uncertainty (±)
100	0.502	0.517	0.015	0.041
	1.002	1.028	0.026	0.042
	1.501	1.527	0.026	0.044
	2.002	2.035	0.033	0.047
	3.003	3.039	0.036	0.053
	5.002	5.042	0.040	0.070

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 -



Certificate of Calibration

Certificate Number : SPR23100263-1

Page : 1 of 3

Customer

: Thai Environmental Technic Limited.

1/6 Soi Ramkhamhaeng 145, Khwaeng Saphan Sung, Khet Saphan
Sung, Bangkok 10240, Thailand.

Equipment Name : Vibration Meter
Manufacturer : Instanitel
Model : 721A2801/721A3301
Serial Number : UM15362
ID. Number : No.10

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ Received Date : 18 Oct 2023
Relative Humidity : $50\% \pm 15\%$ Calibration Date : 23 Oct 2023
Location of Calibration : In-Lab Recommend Due Date : 23 Oct 2024
Calibration Procedure : In-House Method Date of Issue : 24 Oct 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.
The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr. Munin Khumpum

Approved by :

Calibration Officer

(Mr. Nilot Loha)

Authorized Signatory

SP-FM-C4-15 rev.0



Calibration Report

Certificate Number : SPR23100263-1

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due Date
Vibration Calibrator	VC-02	2007014	AV-0048-23	13 Aug 2024

Traceability

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



Result of Calibration

Certificate No. : SPR23100263-1

Page : 3 of 3

Frequency Response Performance Test @ 1 mm/s

Unit : mm/s

Frequency (Hz)	STD Reading	UUC Reading	Error	Uncertainty (±)
20.0	1.014	0.986	-0.028	0.042
40.0	1.011	0.987	-0.024	0.042
50.0	1.009	0.989	-0.020	0.042
80.0	1.007	0.991	-0.016	0.042
100.0	1.006	0.992	-0.014	0.042
150.0	1.007	0.989	-0.018	0.042
200.0	1.009	0.983	-0.026	0.042
500.0	1.012	0.984	-0.028	0.042

Linearity Performance Test

Unit : mm/s

Frequency (Hz)	STD Reading	UUC Reading	Error	Uncertainty (±)
100	0.503	0.490	-0.013	0.041
	1.002	0.987	-0.015	0.042
	1.501	1.484	-0.017	0.044
	2.001	1.981	-0.020	0.047
	3.002	2.976	-0.026	0.053
	5.002	4.972	-0.030	0.070

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 -