

ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือที่ใช้ในการตรวจวิเคราะห์

ตารางการสอบเทียบเครื่องมือที่ใช้ในการตรวจวัดและวิเคราะห์

Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
1.	Ambient 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-31	01/08/2022	August 2023
			High Volume Air Sampler/TET	S/N TSP-34	01/08/2022	August 2023
			High Volume Air Sampler/TET	S/N TSP-31	13/07/2023	July 2024
			High Volume Air Sampler/TET	S/N TSP-37	13/07/2023	July 2024
			High Volume Air Sampler/TET	S/N TSP-39	05/07/2023	July 2024
			High Volume Air Sampler/TET	S/N TSP-41	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-25	04/07/2023	July 2024
		PM-10	Electronic Balance/METTLER TOLEDO	S/N 1116392227	11/04/2023	April 2024
			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 PM10-5	01/08/2022	August 2023
			High Volume Air Sampler/TET	S/N PM10-27	01/08/2022	August 2023
			High Volume Air Sampler/TET	S/N PM10-5	05/07/2023	July 2024
			High Volume Air Sampler/TET	S/N PM10-11	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 PM10-25	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 PM10-23	05/07/2023	July 2024
			Electronic Balance/METTLER TOLEDO	S/N 1116392227	11/04/2023	April 2024



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ตารางการสอบเทียบเครื่องมือที่ใช้ในการตรวจวัดและวิเคราะห์

Item	Description	Parameter	List of Equipment	Equipment No.	Calibration	Next Calibration
1.	Ambient Air (Cont.)	NO _x	Certificate of Analysis/Linde	S/N A009625K	18/08/2021	August 2023
			Certificate of Analysis/Linde	S/N A009175K	05/07/2023	July 2026
			NO _x Analyzer/API 200E	S/N 737	11/05/2023	November 2023
			NO _x Analyzer/Teledyne 200E	S/N 974	12/05/2023	November 2023
			NO _x Analyzer/API 200E	S/N 381	10/05/2023	November 2023
			NO _x Analyzer/API 200A	S/N 542	10/05/2023	November 2023
			NO _x Analyzer/API 200A	S/N 1978	10/05/2023	November 2023
			NO _x Analyzer/API 200A	S/N 56	10/05/2023	November 2023
			NO _x Analyzer/API 200A	S/N 56	09/11/2023	May 2024
			NO _x Analyzer/API 200E	S/N 1732	10/05/2023	November 2023
			NO _x Analyzer/Teledyne 200E	S/N 481	11/05/2023	November 2023
			NO _x Analyzer/API 200A	S/N 1775	01/11/2023	May 2024
		SO ₂	Certificate of Analysis/Linde	S/N 118310	19/09/2019	September 2023
			Certificate of Analysis/Linde	S/N D636157	18/09/2023	September 2027
			SO ₂ Analyzer/API 100A	S/N 195	10/05/2023	November 2023
			SO ₂ Analyzer/API 100E	S/N 2658	10/05/2023	November 2023
			SO ₂ Analyzer/ Teledyne 100E	S/N 1412	11/05/2023	November 2023
			SO ₂ Analyzer/ Teledyne 100E	S/N 062	16/05/2023	November 2023
			SO ₂ Analyzer/API 100E	S/N 139	11/05/2023	November 2023
			SO ₂ Analyzer/API 100A	S/N 856	11/05/2023	November 2023
			SO ₂ Analyzer/Thermo 43C	S/N 43C-TL67266366	12/05/2023	November 2023
			SO ₂ Analyzer/ Teledyne 100E	S/N 062	16/05/2023	November 2023
			SO ₂ Analyzer/API 100A	S/N 1412	10/05/2023	November 2023
			SO ₂ Analyzer/ Thermo 43C	S/N 43C73374373	06/11/2023	May 2024
			SO ₂ Analyzer/API 100E	S/N 1488	08/11/2023	May 2024



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ตารางการสอบเทียบเครื่องมือที่ใช้ในการตรวจวัดและวิเคราะห์

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
			CERTIFICATE OF ANALYSIS : Linde	S/N D271305	11/10/2016	October 2024
			CO Analyzer/Horiba APMA 360CE	S/N 42088-7001	12/05/2023	November 2023
			CO Analyzer/Thermo 42C	S/N 48062-846337	12/05/2023	November 2023
			CO Analyzer/API 300	S/N 1068	12/05/2023	November 2023
			CO Analyzer/Horiba APMA 360CE	S/N 42088-7001	10/11/2023	May 2024
			CO Analyzer/Tyldyne 300E	S/N 1066	10/11/2023	May 2024
		HC as Methane	Personal Air Sampler/Gilian	S/N 101155	06/07/2023	August 2023
			Personal Air Sampler/Gilian	S/N 20110605018	03/08/2023	September 2023
			Personal Air Sampler/Gilian	S/N 20140505073	01/09/2023	October 2023
			Personal Air Sampler/Gilian	S/N 20110505110	04/10/2023	November 2023
			Personal Air Sampler/Gilian	S/N 20111203065	02/11/2023	December 2023
			Personal Air Sampler/Gilian	S/N 20080703002	07/12/2023	January 2023
			Methane NMHC Analyzer/Model 55C	S/N 55C-72555-371	13/01/2023	January 2024
2.	Wastewater	pH	pH Meter/Horiba	S/N B06D0012	01/11/2023	November 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	E.505.0595	10/04/2023	April 2024

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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 100101	24/06/2023	July 2023
			Integrated Sound Level/ACO TYPE 6226	S/N 150142	24/06/2023	July 2023
			Integrated Sound Level/ACO TYPE 6226	S/N 160212	24/06/2023	July 2023
			Integrated Sound Level/ACO TYPE 6226	S/N 100101	24/07/2023	August 2023
			Integrated Sound Level/ACO TYPE 6226	S/N 160098	24/07/2023	August 2023
			Integrated Sound Level/ACO TYPE 6226	S/N 130130	24/07/2023	August 2023
			Integrated Sound Level/ACO TYPE 6226	S/N 100102	24/08/2023	September 2023
			Integrated Sound Level/ACO TYPE 6226	S/N 130130	24/08/2023	September 2023
			Integrated Sound Level/ACO TYPE 6226	S/N 110100	24/09/2023	October 2023
			Integrated Sound Level/ACO TYPE 6226	S/N 130130	24/09/2023	October 2023
			Integrated Sound Level/ACO TYPE 6226	S/N 130130	24/10/2023	November 2023
			Integrated Sound Level/ACO TYPE 6226	S/N 150142	24/10/2023	November 2023
			Integrated Sound Level/ACO TYPE 6226	S/N 070047	25/11/2023	December 2024
			Integrated Sound Level/ACO TYPE 6226	S/N 100098	25/11/2023	December 2024
4.	Vibration	Vibration	Vibration Meter/Micromate	S/N UM12176	19/09/2022	September 2023
			Vibration Meter/Micromate	S/N UM15905	17/01/2023	January 2024
			Vibration Meter/Micromate	S/N UM12176/UM20454	25/09/2023	September 2024

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RECALIBRATION
DUE DATE:
November 19, 2022

Certificate of Calibration

Calibration Certification Information						
Cal. Date:	November 19, 2021	Rootmeter S/N:	438320	Ta:	294	°K mm Hg
Operator:	Jim Tisch			Pa:	763.5	
Calibration Model #:	TE-5025A	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	0.8990	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)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \times \frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
1.0140	0.7161	1.4271	0.9958	0.7033	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
QSTD	m=	1.99331		m=	1.24818
	b=	-0.00049		b=	-0.00030
	r=	0.99999		r=	0.99999

Calculations

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

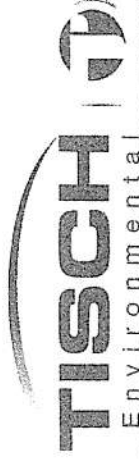
Standard Conditions

Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	rootmeter 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.
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RECALIBRATION
DUE DATE:
September 21, 2023

Certificate of Calibration

Calibration Certification Information			
Cal. Date:	September 21, 2022	Rootmeter S/N:	438320
Operator:	Jim Tisch	Ta:	296 °K
Calibration Model #:	TE 5025A	Pa:	748.3 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	0.8730	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)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \times \frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (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	1.1233	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	0.9850	1.4309	1.7789
QSTD	m=	2.01042		m=	1.25889
	b=	-0.03659		b=	-0.02312
	r=	0.99996		r=	0.99996

Calculations

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

Standard Conditions

Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	rootmeter 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.31) 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) : 754.5
Average Temp (°C) : 31.8 Average Temp: (Deg K) :

Calibration Orifice

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

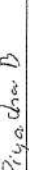
Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m ³ /min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	11.80	1.724	60.0	60.00	Slope : 35.5956
2	9.00	1.505	54.0	54.00	Intercept : 0.0527
3	7.20	1.346	50.0	50.00	Corr. Coeff : 0.9936
4	5.00	1.122	40.0	40.00	
5	3.00	0.869	30.0	30.00	

Calculations

$Q_{std} = 1/m[\sqrt{P_a(P_a/P_{std})}(T_{std}/T_a)-b]$
 $IC = [I[\sqrt{P_a(P_a/P_{std})}(T_{std}/T_a)]]$
 Q_{std} = standard flow rate
 IC = corrected chart response
 I = actual chart response
 m = calibrator Qstd slope
 b = calibrator Qstd intercept
 T_a = actual temperature during calibration (deg K)
 P_a = actual pressure during calibration (mm Hg)
 T_{std} = 298 deg K
 P_{std} = 760 mm Hg
For subsequent calculation of sampler flow:
 $1/m(I)[\sqrt{P_a(298/P_{av})}(P_{av}/760)]-b$
NOTE: Ensure calibration office has been certified within 12 months of use

Calibrate By : 

Approve By : 



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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.34) 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) : 754.5
Average Temp (°C) : 31.8 Average Temp: (Deg K) :

Calibration Orifice

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

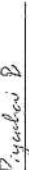
Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m ³ /min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	12.00	1.738	60.0	60.00	Slope : 34.7546
2	9.20	1.522	54.0	54.00	Intercept : 1.0714
3	7.00	1.328	50.0	50.00	Corr. Coeff : 0.9897
4	5.00	1.122	40.0	40.00	
5	3.00	0.869	30.0	30.00	

Calculations

$Q_{std} = 1/m[\sqrt{P_a(P_a/P_{std})}(T_{std}/T_a)-b]$
 $IC = [I[\sqrt{P_a(P_a/P_{std})}(T_{std}/T_a)]]$
 Q_{std} = standard flow rate
 IC = corrected chart response
 I = actual chart response
 m = calibrator Qstd slope
 b = calibrator Qstd intercept
 T_a = actual temperature during calibration (deg K)
 P_a = actual pressure during calibration (mm Hg)
 T_{std} = 298 deg K
 P_{std} = 760 mm Hg
For subsequent calculation of sampler flow:
 $1/m(I)[\sqrt{P_a(298/P_{av})}(P_{av}/760)]-b$
NOTE: Ensure calibration office has been certified within 12 months of use

Calibrate By : 

Approve By : 



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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech
ITEM : TSP
Site ID : Bangkok
Serial No : (No. 31)
Date : 13-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Average Press. (mm Hg) : 750.8
Average Temp (°C) : 29.2
Corrected Pressure (mm Hg) : 750.0
Temperature (deg K) : 298.0
Corrected Average (mm Hg) : -
Average Temp: (Deg K) : -

Calibration Orifice

Make : Tsiach	Qstd Slope : 2.01042
Model : TE-5025A	Qstd Intercept : -0.36590
Serial# : 0068	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 Slope : 29.6170 Intercept : 0.8254 Corr. Coeff : 0.9871
1	12.80	1.962	60.0	57.00	
2	9.20	1.691	54.0	52.00	
3	7.40	1.535	50.0	48.00	
4	5.00	1.294	40.0	40.00	
5	3.00	1.044	30.0	30.00	

Calculations

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

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:

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

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

Calibrate By : Pipat

Approve By : Pipat M.

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 : TSP
Site ID : Bangkok
Serial No : (No. 37)
Date : 13-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Average Press. (mm Hg) : 750.8
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 Orifice

Make : Tsiach	Qstd Slope : 2.01042
Model : TE-5025A	Qstd Intercept : -0.36590
Serial# : 0068	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 Slope : 30.2297 Intercept : 0.1413 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

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

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:

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

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

Calibrate By : Pipat

Approve By : Pipat M.

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 : 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
Average Press. (mm Hg) : 750.6
Corrected Temperature (deg K) : 298.0
Average Temp (°C) : 28.9
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
1	12.80	1.962	60.0	57.00	Slope : 29.4911 Intercept : 1.2335 Corr. Coeff : 0.9818
2	9.20	1.691	54.0	52.00	
3	7.00	1.498	50.0	48.00	
4	5.00	1.294	40.0	40.00	
5	3.00	1.044	30.0	30.00	

Calculations

$Qstd = 1/m[\text{Sqrt}(H_2O)(Pa/Pstd)(Tstd/Ta)] - b$
 $IC = [1/\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$
 m = sampler slope
 b = sampler intercept
 I = chart response
 Tav = daily average temperature
 Pav = daily average pressure
 $Qstd$ = 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:
 $1/m([1/\text{Sqrt}(298/Tav)(Pav/760)] - b)$
NOTE: Ensure calibration office has been certified within 12 months of use

Calibrate By : _____

Approve By : Pipat M.



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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
Corrected Pressure (mm Hg) : 760.0
Average Press. (mm Hg) : 750.6
Corrected Temperature (deg K) : 298.0
Average Temp (°C) : 27.9
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
1	12.50	1.941	60.0	57.00	Slope : 30.3274 Intercept : 0.2083 Corr. Coeff : 0.9837
2	9.00	1.674	54.0	52.00	
3	7.00	1.498	50.0	48.00	
4	5.00	1.294	40.0	40.00	
5	3.00	1.044	30.0	30.00	

Calculations

$Qstd = 1/m[\text{Sqrt}(H_2O)(Pa/Pstd)(Tstd/Ta)] - b$
 $IC = [1/\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$
 m = sampler slope
 b = sampler intercept
 I = chart response
 Tav = daily average temperature
 Pav = daily average pressure
 $Qstd$ = 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:
 $1/m([1/\text{Sqrt}(298/Tav)(Pav/760)] - b)$
NOTE: Ensure calibration office has been certified within 12 months of use

Calibrate By : _____

Approve By : Pipat M.



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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech
ITEM : TSP
Site ID : Bangkok
Serial No : (No. 41)
Date : 13-Jul-23
Calibrate By : pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Average Press. (mm Hg) : 750.8
Average Temp (°C) : 29.2
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 (m ³ /min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	12.10	1.912	60.0	57.00	Slope : 30.9129 Intercept : 0.6070 Corr. Coeff : 0.9909
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

$Q_{std} = 1/m[\sqrt{(H_2O)(P_a/P_{std})(T_{std}/T_a))}-b]$
 $IC = [1/\sqrt{(P_a/P_{std})(T_{std}/T_a))}]$
 Q_{std} = standard flow rate
 IC = corrected chart response
 I = actual chart response
 m = calibrator Qstd slope
 b = calibrator Qstd intercept
 T_a = actual temperature during calibration (deg K)
 T_{std} = 298 deg K
 P_{std} = 760 mm Hg
For subsequent calculation of sampler flow:
 $1/m[(1/\sqrt{(298/T_a)(P_a/P_{std})})-b]$
NOTE: Ensure calibration orifice has been certified within 12 months of use

m = sampler slope
 b = sampler intercept
 I = chart response
 T_a = daily average temperature
 P_a = daily average pressure

Calibrate By : _____

Approve By : _____

Perennial M



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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech
ITEM : TSP
Site ID : Bangkok
Serial No : (No. 25)
Date : 4-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) : 28.4
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 (m ³ /min)	Indicate (CFM)	IC (corrected)	Linear Regression
1	12.50	1.941	60.0	57.00	Slope : 30.2297 Intercept : 0.1413 Corr. Coeff : 0.9875
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

$Q_{std} = 1/m[\sqrt{(H_2O)(P_a/P_{std})(T_{std}/T_a))}-b]$
 $IC = [1/\sqrt{(P_a/P_{std})(T_{std}/T_a))}]$
 Q_{std} = standard flow rate
 IC = corrected chart response
 I = actual chart response
 m = calibrator Qstd slope
 b = calibrator Qstd intercept
 T_a = actual temperature during calibration (deg K)
 P_a = actual pressure during calibration (mm Hg)
 T_{std} = 298 deg K
 P_{std} = 760 mm Hg
For subsequent calculation of sampler flow:
 $1/m[(1/\sqrt{(298/T_a)(P_a/P_{std})})-b]$
NOTE: Ensure calibration orifice has been certified within 12 months of use

m = sampler slope
 b = sampler intercept
 I = chart response
 T_a = daily average temperature
 P_a = daily average pressure

Calibrate By : _____

Approve By : _____

Perennial M



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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech
ITEM : TSP
Site ID : Bangkok
Serial No : (No. 37)
Date : 13-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Average Press. (mm Hg) : 750.8
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 : 30.2297 Intercept : 0.1413 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

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

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

$$Qstd = \text{standard flow rate}$$

$$IC = \text{corrected chart response}$$

$$I = \text{actual chart response}$$

$$m = \text{calibrator Qstd slope}$$

$$b = \text{calibrator Qstd intercept}$$

$$Pa = \text{actual pressure during calibration (mm Hg)}$$

$$Tstd = 298 \text{ deg K}$$

$$Pstd = 760 \text{ mm Hg}$$

$$Ta = \text{actual temperature during calibration (deg K)}$$

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

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

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

$$m = \text{sampler slope}$$

$$b = \text{sampler intercept}$$

$$I = \text{chart response}$$

$$Tav = \text{daily average temperature}$$

$$Pav = \text{daily average pressure}$$

$$Calibrate By : \text{Pipat}$$

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NOTE: Ensure calibration office 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. 5)
Date : 1-Aug-22
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Average Press. (mm Hg) : 754.9
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 : 1.99331
Qstd Intercept : -0.00049
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 : 34.7546 Intercept : 1.0714 Corr. Coeff : 0.9837
1	12.00	1.738	60.0	60.00	
2	9.20	1.522	54.0	54.00	
3	7.00	1.328	50.0	50.00	
4	5.00	1.122	40.0	40.00	
5	3.00	0.869	30.0	30.00	

Calculations

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

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

$$Qstd = \text{standard flow rate}$$

$$IC = \text{corrected chart response}$$

$$I = \text{actual chart response}$$

$$m = \text{calibrator Qstd slope}$$

$$b = \text{calibrator Qstd intercept}$$

$$Ta = \text{actual temperature during calibration (deg K)}$$

$$Pa = \text{actual pressure during calibration (mm Hg)}$$

$$Tstd = 298 \text{ deg K}$$

$$Pstd = 760 \text{ mm Hg}$$

$$For subsequent calculation of sampler flow:$$

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

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

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

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

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

$$m = \text{sampler slope}$$

$$b = \text{sampler intercept}$$

$$I = \text{chart response}$$

$$Tav = \text{daily average temperature}$$

$$Pav = \text{daily average pressure}$$

$$Calibrate By : \text{Pipat}$$

$$Calibrate By : \text{Pipat}$$

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$$Calibrate By : \text{Pipat}$$

NOTE: Ensure calibration office 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. 27)
Date : 1-Aug-22
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (deg K) : 298.0
Corrected Average (mm Hg) : 754.5
Average Temp (deg K) : 32.4
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Corrected Average (mm Hg) : 754.5
Average Temp (deg K) : 32.4

Calibration Orifice

Make : Tische
Model : TS-5025A
Serial# : 0068
Qstd Slope : 1.99331
Qstd Intercept : -0.00049
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	12.60	1.781	62.0	62.00	Slope : 33.4792
2	10.20	1.502	56.0	56.00	Intercept : 3.0890
3	7.80	1.401	52.0	52.00	Corr. Coeff : 0.9940
4	5.20	1.144	42.0	42.00	
5	3.20	0.898	32.0	32.00	# of Observations: 5

Calculations

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

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

m = calibrator Qstd slope
b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

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

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. 5)
Date : 5-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (deg K) : 298.0
Corrected Average (mm Hg) : 750.8
Average Temp (deg K) : 29.2
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Corrected Average (mm Hg) : 750.8
Average Temp (deg K) : 29.2

Calibration Orifice

Make : Tische
Model : TS-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
1	12.00	1.741	60.0	60.00	Slope : 35.1297
2	9.20	1.927	54.0	54.00	Intercept : 0.2052
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

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

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

m = calibrator Qstd slope
b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

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

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. 11)
Date : 4-Jul-23
Calibrate By : Pipat

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 28.0
Average Press. (mm Hg) : 750.6
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Corrected Average (mm Hg) :
Average Temp: (Deg K) : 28.2

Calibration Orifice


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

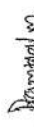
Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m ³ /min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 35.0529 Intercept : 0.4420 Corr. Coeff : 0.9897
1	12.00	1.741	60.0	60.00	
2	9.20	1.527	54.0	54.00	
3	7.00	1.334	50.0	50.00	
4	5.00	1.130	40.0	40.00	
5	3.00	0.880	30.0	30.00	# of Observations: 5

Calculations

$Qstd = 1/m[\text{Sort}(H_2O)(Pa/Pstd)(Tstd/Ta))-b]$
 $IC = [(\text{Sort}(Pa/Pstd)(Tstd/Ta))]$
 $Qstd = \text{standard flow rate}$
 $IC = \text{corrected chart response}$
 $I = \text{actual chart response}$
 $m = \text{calibrator Qstd slope}$
 $b = \text{calibrator Qstd intercept}$
 $Ta = \text{actual temperature during calibration (deg K)}$
 $Pa = \text{actual pressure during calibration (mm Hg)}$
 $Tstd = 298 \text{ deg K}$
 $Pstd = 760 \text{ mm Hg}$
For subsequent calculation of sampler flow:
 $1/m[(I)(\text{Sort}(298/Tav)(Pav/760))-b]$
NOTE: Ensure calibration orifice has been certified within 12 months of use

Calibrate By : 

Approve By : 



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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) : 760.00
Temperature (°C) : 28.0
Average Press. (mm Hg) : 750.6
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Corrected Average (mm Hg) :
Average Temp: (Deg K) : 28.7

Calibration Orifice


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

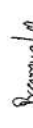
Calibration Information

Plate or Test #	ORIFICE (in H ₂ O)	Qstd (m ³ /min)	Indicate (CFM)	IC (corrected)	Linear Regression Slope : 35.0529 Intercept : 0.4420 Corr. Coeff : 0.9897
1	12.00	1.741	60.0	60.00	
2	9.20	1.527	54.0	54.00	
3	7.00	1.334	50.0	50.00	
4	5.00	1.130	40.0	40.00	
5	3.00	0.880	30.0	30.00	# of Observations: 5

Calculations

$Qstd = 1/m[\text{Sort}(H_2O)(Pa/Pstd)(Tstd/Ta))-b]$
 $IC = [(\text{Sort}(Pa/Pstd)(Tstd/Ta))]$
 $Qstd = \text{standard flow rate}$
 $IC = \text{corrected chart response}$
 $I = \text{actual chart response}$
 $m = \text{calibrator Qstd slope}$
 $b = \text{calibrator Qstd intercept}$
 $Ta = \text{actual temperature during calibration (deg K)}$
 $Pa = \text{actual pressure during calibration (mm Hg)}$
 $Tstd = 298 \text{ deg K}$
 $Pstd = 760 \text{ mm Hg}$
For subsequent calculation of sampler flow:
 $1/m[(I)(\text{Sort}(298/Tav)(Pav/760))-b]$
NOTE: Ensure calibration orifice has been certified within 12 months of use

Calibrate By : 

Approve By : 



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High Volume TSP&PM-10 Calibration Report

Location : Thai Environmental Tech Site ID : Bangkok Date : 11-Jul-23
ITEM : PM10 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) : 750.8 Corrected Average (mm Hg) : -
Average Temp (°C) : 29.2 Average Temp (deg K) : -

Calibration Orifice

Make : Tisch Qstd Slope : 2.01042
Model : TS-5025A Qstd Intercept : -0.03659
Serial# : 0068 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 : 35.3007
2	9.00	1.510	54.0	54.00	Intercept : 0.2307
3	7.00	1.334	50.0	50.00	Corr. Coeff : 0.9994
4	5.00	1.130	40.0	40.00	
5	3.00	0.880	30.0	30.00	# of Observations: 5

Calculations

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

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

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:

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

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

Calibrate By : _____

Approve By : Pranuchit M

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

Calculations

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

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

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:

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

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

Calibrate By : _____

Approve By : Pranuchit M

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 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) : 25.0 Temperature (deg K) : 298.0
Average Press. (mm Hg) : 750.3 Corrected Average (mm Hg) : -
Average Temp (°C) : 28.5 Average Temp (deg K) : -

Calibration Orifice

Make : Tisch Qstd Slope : 2.01042
Model : TS-5025A Qstd Intercept : -0.03659
Serial# : 0068 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 : 35.0529
2	9.20	1.527	54.0	54.00	Intercept : 0.4420
3	7.00	1.334	50.0	50.00	Corr. Coeff : 0.9997
4	5.00	1.130	40.0	40.00	
5	3.00	0.880	30.0	30.00	# of Observations: 5



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High Volume TSP&PM-10 Calibration Report

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

Site Conditions

Barometric Pressure (mm Hg) : 760.00
Temperature (°C) : 25.0
Average Press. (mm Hg) : 750.8
Average Temp (°C) : 23.4
Corrected Pressure (mm Hg) : 760.0
Temperature (deg K) : 298.0
Corrected Average (mm Hg) : 750.0
Average Temp (Deg K) :

Calibration Orifice

Make : Tisch
Model : TS-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	12.80	1.798	62.0	62.00	Slope : 35.1530
2	10.20	1.607	56.0	56.00	Intercept : 0.0074
3	7.60	1.389	52.0	52.00	Corr. Coeff : 0.9904
4	5.20	1.152	40.0	40.00	
5	3.00	0.880	30.0	30.00	

Calculations

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

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:

$$1/m(I) \sqrt{(Pa/Pav)(Tav/Tstd) - b}$$

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

Calibrate By : Pipat

Approve By : Pipat

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUKHUMVIT, SUKHUMVIT 10250
TEL. 0-2717-3000-29 FAX. 0-2719-5484



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
1/6 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 80 %

Calibrated by : Khit Rutanaprapachai

Approved by : Pipat
Approved Signatory

() Pomthippa Tameyakul

() Malee Buikrua

() Suwit Injai

Issue Date : 25 April 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 3 : Equipment Calibration and Testing Services.

A 0053464



Cert.No.: 23MM160
Page: 2 of 3

Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2304-0146OC-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)	15884	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)
100	99.9982	+0.0018	0.18
200	199.9965	+0.0035	0.29
After Adjustment :		(n = 10)	
1. Determination of the standard deviation of weighing machine			
Standard Deviation of Reading (g)			
Applied Weight (g)			
100		0.00007	
200		0.00007	

Md.

a 1158499



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

Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2304-0146OC-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 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	Maximum difference between off-center and central loading (g)
-0.0002	-0.0002	-0.0003	-0.0003	-0.0002	0.0001

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 %.

-o0o-

Md.

a 1158498



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Analyzer Calibration Report

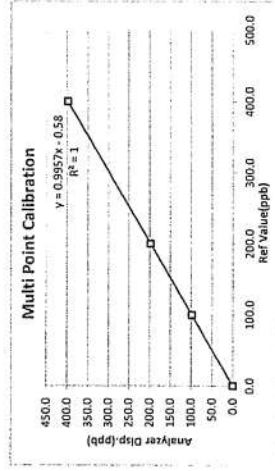
Calibrate Date : 11-May-23
Analyzer Type : NOx
Brand : TEI
Model : 200 E
Serial Number : 737 (No. 27)
Range : 500 ppb
Temperature (°C) : 25°C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.0%RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00962 SK

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	1.3	1.1	0.2	0.0	0.0	0.0	0.0
Span	400.0	394.0	391.0	3.0	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	0.5	0.4	0.1	0.40	0.001	0.10
100.0	99.3	98.4	0.9	-1.60	-0.016	1.60
200.0	198.8	197.5	1.3	-2.50	-0.013	1.25
400.0	399.1	398.4	0.7	-1.60	-0.004	0.40
Average Diff (%)						1.08



Calibrate by: gds

Approved by: Piyachon B

แก้ไขครั้งที่ : 00

วันที่อนุมัติ : 02/09/15

แก้ไขแบบฟอร์ม : QF-QP16-06

Thai Environmental Technic Limited 116 Soi Ramkhamhaeng 145 Khwaeng/Khet Saphan Sung Bangkok 10240 Thailand
Tel : +66(0)2373-7799(Auto) Fax : +66(0)2373-7979 • admin@te11995.com • www.te11995.com



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Analyzer Calibration Report

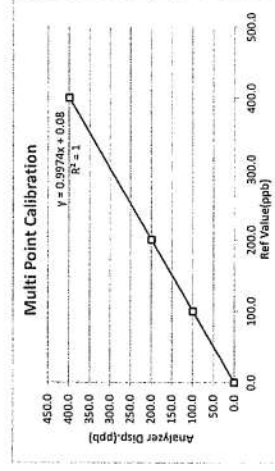
Calibrate Date : 12-May-23
Analyzer Type : NOx
Brand : Teledyne
Model : 200 E
Serial Number : 974 (No. 34)
Range : 500 ppb
Temperature (°C) : 25°C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.0%RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00962 SK

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		Abs. (%) Diff
	NOx	NO	NO ₂	Diff(ppb)	% 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: gds

Approved by: Piyachon B

แก้ไขครั้งที่ : 00

วันที่อนุมัติ : 02/09/15

แก้ไขแบบฟอร์ม : QF-QP16-06

Thai Environmental Technic Limited 116 Soi Ramkhamhaeng 145 Khwaeng/Khet Saphan Sung Bangkok 10240 Thailand
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Analyzer Calibration Report

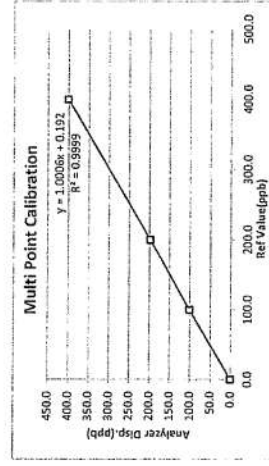
Calibrate Date : 10-May-23
Analyzer Type : NOx
Brand : API
Model : API M700 S/N 625
Serial Number : 361 (No. 21)
Range : 500 ppb
Temperature (°C) : 25 °C
Barometer (mmHg) : 759.9
Humidity (RH) : 50.04RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00962 BK

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	1.1	0.7	0.0	0.0	0.0	0.0
Span	400.0	455.0	423.0	32.0	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	0.5	0.3	0.1	0.32	0.001	0.08
100.0	101.5	101.3	0.2	1.30	0.013	1.30
200.0	199.8	198.5	1.3	-1.50	-0.008	0.75
400.0	401.2	401.1	0.1	1.10	0.003	0.28
Average Diff (%)						0.60



Calibrate by:

Approved by:

วันที่วัด : 00

วันที่สอบ : 02/09/15

หมายเลข : QP-QP16-06

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

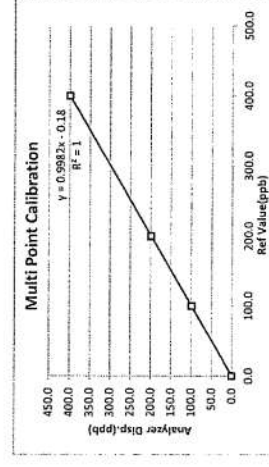
Calibrate Date : 10-May-23
Analyzer Type : NOx
Brand : API
Model : API M700 S/N 625
Serial Number : 542 (No. 29)
Range : 500 ppb
Temperature (°C) : 25 °C
Barometer (mmHg) : 759.9
Humidity (RH) : 50.04RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00962 BK

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	0.7	0.5	0.2	0.0	0.0	0.0	0.0
Span	400.0	411.0	407.0	4.0	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	0.5	0.4	0.1	0.40	0.001	0.10
100.0	99.8	99.1	0.7	-0.90	-0.009	0.90
200.0	199.3	199.1	0.2	-0.90	-0.005	0.45
400.0	399.7	399.4	0.3	-0.60	-0.002	0.15
Average Diff (%)						0.50



Calibrate by:

Approved by:

วันที่วัด : 00

วันที่สอบ : 02/09/15

หมายเลข : QP-QP16-06

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

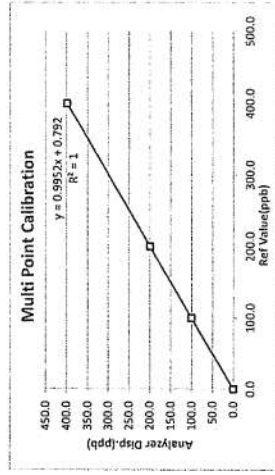
Calibrate Date : 10-May-23
Analyzer Type : NOx
Brand : API
Model : 200A
Serial Number : 1978 (No. 15)
Range : 500 ppb
Temperature (°C) : 25°C
Barometer (mmHg) : 759.9
Humidity (50±15 %) : 50.04%RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00962 SK

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	0.6	0.6	0.0	0.0	0.0	0.0	0.0
Span	400.0	412.0	109.0	2.9	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	0.5	0.3	0.2	0.32	0.001	0.08
100.0	101.2	101.1	0.1	1.10	0.011	1.10
200.0	199.8	199.6	0.2	-0.40	-0.002	0.20
400.0	399.4	398.8	0.6	-1.20	-0.003	0.30
Average Diff (%)						0.42



Calibrate by: Yus S.

Approved by: Piyakorn B

แก้ไขครั้งที่ : 00

วันที่อนุมัติ : 02/09/15

แก้ไขแบบฟอร์ม : QP-QP16-06

The Environmental Technic Limited 1/6 Soi Raminthabang 145 Khwaeng Khet Saphan Sung Bangkok 10240 Thailand
Tel : +66(0)2373-7799(Auto) Fax : +66(0)2373-7797 • admin@let1995.com • www.let1995.com



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

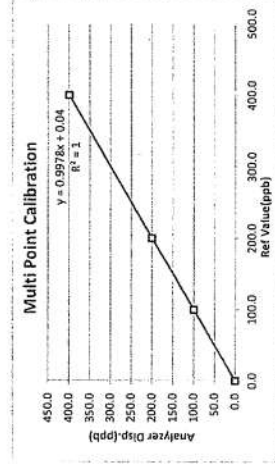
Calibrate Date : 10-May-23
Analyzer Type : NOx
Brand : API
Model : 200A
Serial Number : 55 (No. 17)
Range : 500 ppb
Temperature (°C) : 25°C
Barometer (mmHg) : 759.9
Humidity (50±15 %) : 50.04%RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00962 SK

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	0.9	0.4	0.5	0.0	0.0	0.0	0.0
Span	400.0	384.0	381.0	3.0	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	0.5	0.3	0.2	0.30	0.001	0.08
100.0	99.4	99.4	0.0	-0.60	-0.006	0.60
200.0	199.8	199.7	0.1	-0.30	-0.002	0.15
400.0	399.5	399.2	0.3	-0.80	-0.002	0.20
Average Diff (%)						0.26



Calibrate by: Yus S.

Approved by: Piyakorn B

แก้ไขครั้งที่ : 00

วันที่อนุมัติ : 02/09/15

แก้ไขแบบฟอร์ม : QP-QP16-06

The Environmental Technic Limited 1/6 Soi Raminthabang 145 Khwaeng Khet Saphan Sung Bangkok 10240 Thailand
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NOx Analyzer Calibration Report

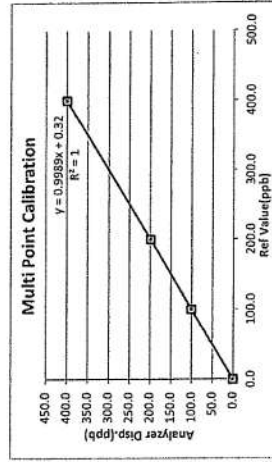
Calibrate Date : 9-Nov-23
Analyzer Type : NOx
Brand : API
Model : 200A
Serial Number : 56 (No. 17)
Range : 500 ppb
Temperature (°C) : 25°C
Barometer (mmHg) : 759.9
Humidity (50±15 %) : 50.04RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00917 SK

Calibration of Span

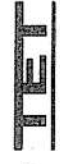
Supply Gas	Ref Value(ppb)	Before of Span(ppb)			After of Span(ppb)			% diff of Span
		NOx	NO	NO ₂	NOx	NO	NO ₂	
Zero	0.0	1.2	1.1	0.1	0.0	0.0	0.0	0.0
Span	400.0	399.8	398.4	1.4	400.0	400.0	0.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)			Output Difference		
	NOx	NO	NO ₂	Diff(ppb)	% Diff	Abs (%) Diff
0.0	0.3	0.1	0.2	0.10	0.000	0.03
100.0	101.2	101.1	0.1	1.10	0.011	1.10
200.0	199.8	199.2	0.6	-0.80	-0.004	0.40
400.0	400.3	400.1	0.2	0.10	0.000	0.03
Average Diff (%)						
0.39						



Calibrate by: gplus
Approved by: Ramulm



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บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

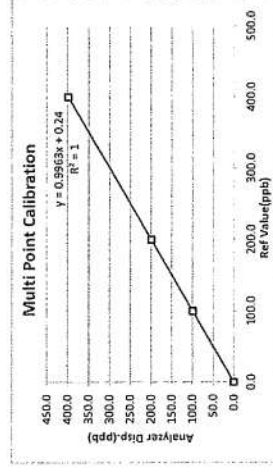
Calibrate Date : 11-May-23
Analyzer Type : NOx
Brand : Telsdyne
Model : 200 E
Serial Number : 481 (No. 37)
Range : 500 ppb
Temperature (°C) : 25°C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.04RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00962 SK

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	1.3	1.0	0.3	0.0	0.0	0.0	0.0
Span	400.0	423.0	420.0	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: gplus
Approved by: Piyak B



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

Calibrate Date : 10-May-23
Analyzer Type : NOx
Brand : API
Model : 200 B
Serial Number : 1732 (No.5)
Range : 500 ppb

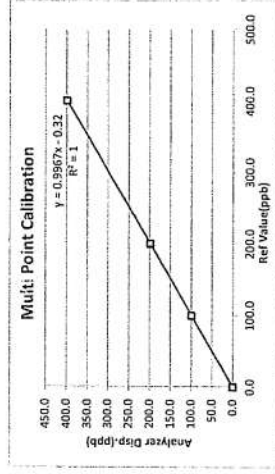
Temperature (°C) : 25°C
Barometer (mmHg) : 759.9
Humidity (50±15 %) : 50.03RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00942 SK

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		
	NOx	NO	NO ₂	Diff(ppb)	% Diff	Abs (%) 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: YWS

Approved by: Piyado B



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

NOx Analyzer Calibration Report

Calibrate Date : 1-Nov-23
Analyzer Type : NOx
Brand : API
Model : 200 A
Serial Number : 1775 (No.26)
Range : 500 ppb

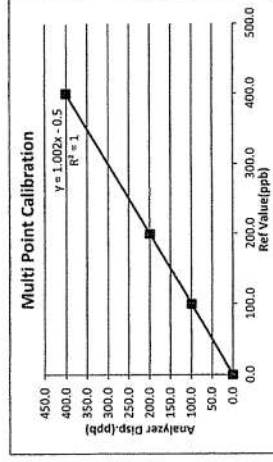
Temperature (°C) : 25°C
Barometer (mmHg) : 759.9
Humidity (50±15 %) : 50.03RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : A00917 SK

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	1.2	0.6	0.0	0.0	0.0	0.0
Span	400.0	395.0	391.0	4.0	400.0	400.0	0.0	0.0

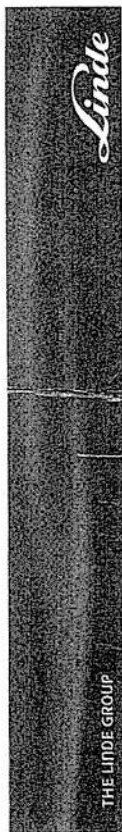
Multi Point Calibration

Ref Value(ppb)	Analyzer Disp.(ppb)			Output Difference		
	NOx	NO	NO ₂	Diff(ppb)	% Diff	Abs (%) Diff
0.0	0.7	0.3	0.4	0.30	0.001	0.08
100.0	99.1	99.1	0.0	-0.90	-0.009	0.90
200.0	199.7	199.2	0.5	-0.80	-0.004	0.40
400.0	401.2	400.8	0.4	0.80	0.002	0.20
Average Diff (%)						0.39



Calibrate by: gpus

Approved by: Pamw M



THE LINDE GROUP

Linde

Certificate of Analysis Special Gases Mixture

Customer Details
Name: Thai Environmental Technic Ltd.
Address: 1/6 Soi Ramkhamhaeng 145,
Saphanchoeng, Saphanchoeng, Bangkok
10240
Customer Tag No.: 10240

Certificate Details
Number: 3367/19
Date of Issue: 19-Sep-2019
Expiry date: 18-Sep-2023
Material Details
Production Order: 90155812
Material Code: 608400-SK-44
Cylinder No.: 118310
Gas content: 5.520 M³
Filling pressure: 145.0 bar
Valve: CGA 660 SS
Cylinder Owner: LINDE
Cylinder Material: Spectra seal
Cylinder Size: 40.0 L

Laboratory Report
Analytical Result
Component: Sulphur Dioxide
In Nitrogen
Nominal Concentration: 40.0 ppm
Analysis Result¹: 41.4 ppm
Uncertainty²: ± 1% relative
Method of Analysis³: (6) I-PB-352
Assay Date: 10-Sep-8 19-Sep-19

Reference Standard used in Assay
Reference Standard: Sulphur Dioxide
In Nitrogen
Cylinder number: 11382356
Concentration: 25.50±0.25 ppm
Expiry date: 7-Mar-2021

Instrument/Make/Model
FTIR Spectrometers Nicolet iSSO
Analytical Principle: FTIR-SO2
Last Multipoint Calibration: 10-Sep-2019

Recommend usage condition
Minimum utilization: 5% of actual content or before expiry date whichever comes first.
Storage condition: Keep in well ventilation and secure area.

Comments
When reordering, please quote the material number

Note:
1. All results expressed in this report are on a molar/mole basis, unless otherwise specified. The Assay of this Standard has been performed in accordance with the ISO 9000:2015 and ISO 9001:2015. The purity of the gas is certified to be 99.999% (99.999% by volume).
2. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.
The measurement of this material is traceable to the SI through the reference gas standard which is traceable to Swiss National Standard of Mass or other recognised national metrology institutes.
3. (1) Gas Chromatography, (2) Paramagnetic Oxygen Analyser, (3) Electrochemical Oxygen Analyser, (4) Electrochemical Moisture Analyser, (5) Total Hydrocarbon Analyser, (6) Other - Specified

Page 1 of 1
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PH-002/71006
15/11/21, 01 March 2018
Linde (Thailand) Public Company Limited
15th Floor, Bangna Tower A, 2/3 Moo 14, Bangna Road, 6.5 Road, Bangkok
Bangkok, Samutprakan 10540, Tel (66) 2388-4100 Fax (66) 2388-4333
Telex: 900000000000000000
Bangkok Plant: 105 Moo 5, Bangna Road, A Bangkok, Chonburi 24180
Thailand, Tel (66) 38-579-479-9 Fax (66) 38-579-333

THE LINDE GROUP

Certificate of Analysis Special Gases Mixture

Customer Details
Name: Thai Environmental Technic Limited.
Address: 1/6 Soi Ramkhamhaeng 45, Saphanchoeng,
Khet Saphan Sung, Bangkok 10240
Customer Tag No.: 10240

Certificate Details
Number: 2500/23
Date of Issue: 18-Sep-2023
Expiry date: 18-Sep-2027
Material Details
Production Order: 90179846
Material Code: 608400-SK-44
Cylinder No.: D636157
Gas content: 5.520 M³
Filling pressure: 145 bar
Valve: CGA 660 SS
Cylinder Owner: LINDE
Cylinder Material: Spectra seal
Cylinder Size: 40 L

Laboratory Report
Analytical Result
Component: Sulphur Dioxide
In Nitrogen
Nominal Concentration: 40.0 ppm
Analysis Result¹: 41.1 ppm
Uncertainty²: ± 1% relative
Method of Analysis³: (6) I-PB-352
Assay Date: 8-Sep-6 18-Sep-23

Reference Standard used in Assay
Reference Standard: Sulphur Dioxide
In Nitrogen
Cylinder number: BOC15062956
Concentration: 25.35 ± 0.25 ppm
Expiry date: 9-Jun-2024

Instrument/Make/Model
FTIR Spectrometers Nicolet iSSO
Analytical Principle: FTIR-SO2
Last Multipoint Calibration: 6-Sep-2023

Recommend usage condition
Minimum utilization: 5% of actual content or before expiry date whichever comes first.
Storage condition: Keep in well ventilation and secure area.

Comments
When reordering, please quote the material number

Note:
1. All results expressed in this report are on a molar/mole basis, unless otherwise specified. The Assay of this Standard has been performed in accordance with the ISO 9000:2015 and ISO 9001:2015. The purity of the gas is certified to be 99.999% (99.999% by volume).
2. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.
The measurement of this material is traceable to the SI through the reference gas standard which is traceable to Swiss National Standard of Mass or other recognised national metrology institutes.
3. (1) Gas Chromatography, (2) Paramagnetic Oxygen Analyser, (3) Electrochemical Oxygen Analyser, (4) Electrochemical Moisture Analyser, (5) Total Hydrocarbon Analyser, (6) Other - Specified

Page 1 of 1
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PH-002/71006
15/11/21, 01 August 2023
Linde (Thailand) Public Company Limited
15th Floor, Bangna Tower A, 2/3 Moo 14, Bangna Road, 6.5 Road, Bangkok
Bangkok, Samutprakan 10540, Tel (66) 2388-4100 Fax (66) 2388-4333
Telex: 900000000000000000
Bangkok Plant: 105 Moo 5, Bangna Road, A Bangkok, Chonburi 24180
Thailand, Tel (66) 38-579-479-9 Fax (66) 38-579-333



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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

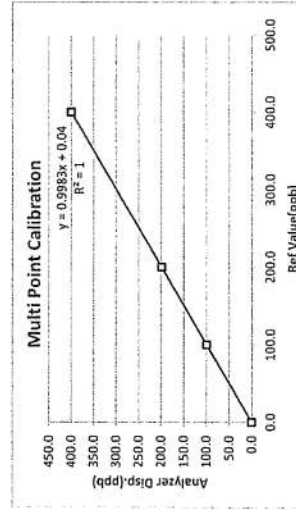
Temperature (°C) : 25 °C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 118310

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: Yd.S.

Approved by: Piyachon-B

แก้ไขครั้งที่ : 00

วันที่อนุมัติ 02/09/15

เลขที่แบบฟอร์ม : 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)2373-7979 • admin@tet1995.com • www.tet1995.com



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Analyzer Calibration Report

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

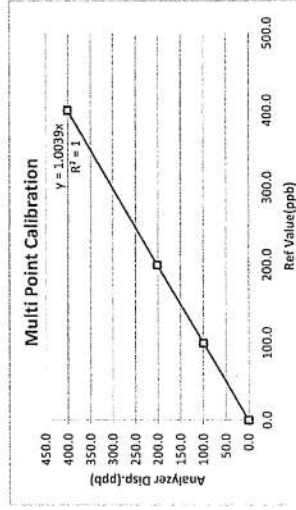
Temperature (°C) : 25 °C
Barometer (mmHg) : 755.0
Humidity (50±15 %) : 50.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 118310

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: Yd.S.

Approved by: Piyachon-B

แก้ไขครั้งที่ : 00

วันที่อนุมัติ 02/09/15

เลขที่แบบฟอร์ม : QF-QP16-06

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

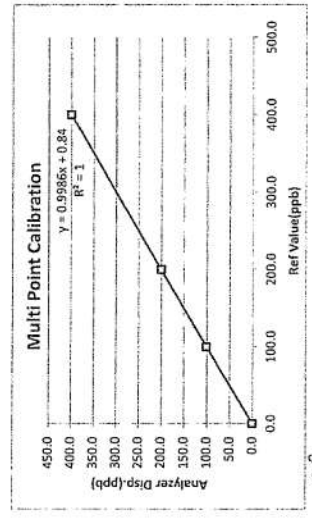
Calibrate Date : 11-May-23
Analyzer Type : SO₂
Brand : Teledyne
Model : 100 E
Serial Number : 1412 (No. 22)
Range : 500 ppm
Temperature (°C) : 25 °C
Barometer (mmHg) : 759.8
Humidity (50±15 %) : 50.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 118310

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)	Percent Diff	Abs Percent Diff
0.0	0.4	0.4	0.00	0.10
100.0	101.2	1.2	0.01	1.20
200.0	200.7	0.7	0.00	0.35
400.0	400.1	0.1	0.00	0.03
Average Diff (%)		0.42		



Calibrate by: gdr-s
Approved by: Piyachon B

แก้ไขครั้งที่ : 00 วันที่อนุมัติ 02/09/15 เลขที่แบบฟอร์ม: QF-QM6-06

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

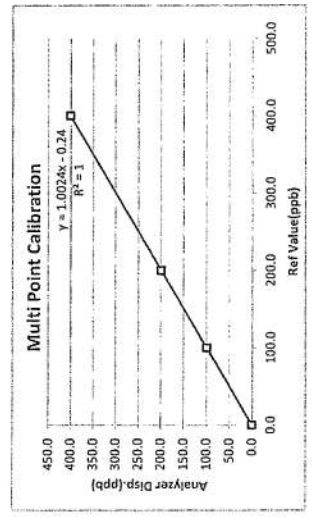
Calibrate Date : 16-May-23
Analyzer Type : SO₂
Brand : Teledyne
Model : 100 E
Serial Number : 062 (No. 23)
Range : 500 ppm
Temperature (°C) : 25 °C
Barometer (mmHg) : 758.2
Humidity (50±15 %) : 52.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 118310

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	391.0	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	199.4	-0.6	0.00	0.30
400.0	401.2	1.2	0.00	0.30
Average Diff (%)		0.25		



Calibrate by: gdr-s
Approved by: Piyachon B

แก้ไขครั้งที่ : 00 วันที่อนุมัติ 02/09/15 เลขที่แบบฟอร์ม: QF-QM6-06

Thai Environmental Technic Limited 1/6 Soi Ramkhamhaeng 145 Khwaeng/Khwaet Saphan Sung Bangkok 10240 Thailand
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Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

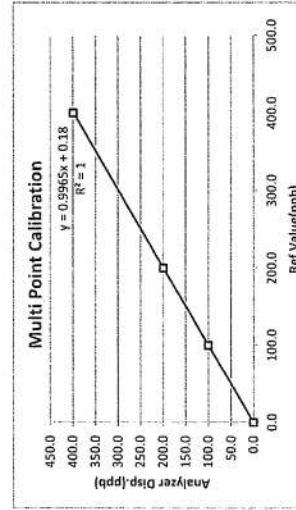
Calibrate Date : 11-May-23
Analyzer Type : SO₂
Brand : API
Model : 100 E
Serial Number : 139 (No.1)
Range : 500 ppb
Temperature (°C) : 25 °C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 118310

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span(ppb)	After of Span(ppb)	Abs% diff of Span
Zero	0.0	1.3	0.0	0.0
Span	400.0	403.0	400.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp(ppb)	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	399.0	-1.0	0.00	0.25
Average Diff (%)				0.25



Calibrate by: *Y.S.*

Approved by: *Piyakorn B.*

แก้ไขครั้งที่ : 00

วันที่อนุมัติ 02/09/15

เลขที่แบบฟอร์ม : QF-QP16-06

Thai Environmental Technic Limited 1/6 Soi Ramhambhaeng 145 Khwaeng/Khet Suanthung Bangkok 10240 Thailand
• Tel : +66(0)2373-7799(Auto) Fax : +66(0)2373-7799 • admin@tiet1995.com • www.tiet1995.com



TET

Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

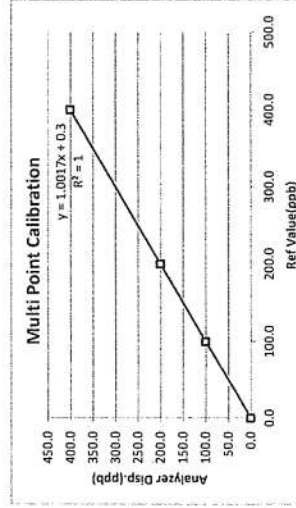
Calibrate Date : 11-May-23
Analyzer Type : SO₂
Brand : API
Model : 100 A
Serial Number : 856 (No.5)
Range : 500 ppb
Temperature (°C) : 25 °C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 118310

Calibration of Span

Supply Gas	Ref Value(ppb)	Before of Span(ppb)	After of Span(ppb)	Abs% diff of Span
Zero	0.0	0.7	0.0	0.0
Span	400.0	395.0	400.0	0.0

Multi Point Calibration

Ref Value(ppb)	Analyzer Disp(ppb)	Diff (ppb)	Percent Diff	Abs Percent Diff
0.0	0.4	0.4	0.00	0.10
100.0	100.5	0.5	0.01	0.50
200.0	200.4	0.4	0.00	0.20
400.0	401.1	1.1	0.00	0.28
Average Diff (%)				0.27



Calibrate by: *Y.S.*

Approved by: *Piyakorn B.*

แก้ไขครั้งที่ : 00

วันที่อนุมัติ 02/09/15

เลขที่แบบฟอร์ม : QF-QP16-06

Thai Environmental Technic Limited 1/6 Soi Ramhambhaeng 145 Khwaeng/Khet Suanthung Bangkok 10240 Thailand
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Thai Environmental Technic Limited
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Analyzer Calibration Report

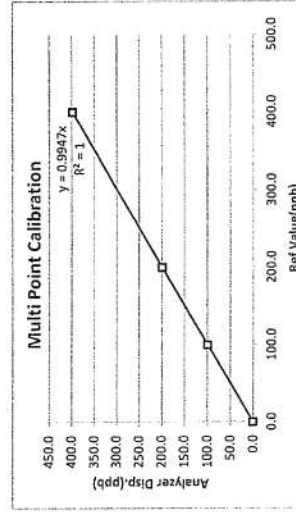
Calibrate Date : 12-May-23
Analyzer Type : SO₂
Brand : Thermo
Model : 43C
Serial Number : 43C-TL-67266366 (No. 9)
Range : 500 ppb
Temperature (°C) : 25 °C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 11831.0

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	0.10
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: Ydris

Approved by: Piyachon B

วันที่ตรวจ: 00

วันที่อนุมัติ: 02/09/15

เลขที่อนุมัติ: QF-QP16-06

Thai Environmental Technic Limited 1/6 Soi Rantamhaeng 145 Khwaeng/Khet Saphan Sung Bangkok 10240 Thailand
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Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

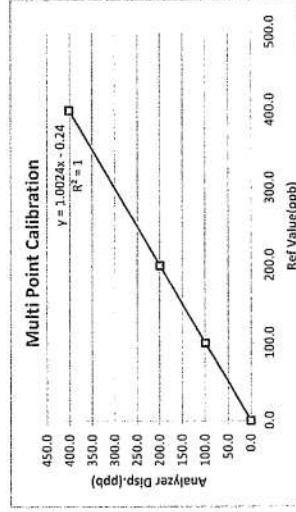
Calibrate Date : 16-May-23
Analyzer Type : SO₂
Brand : Teledyne
Model : 100 B
Serial Number : 062 (No. 23)
Range : 500 ppb
Temperature (°C) : 25 °C
Barometer (mmHg) : 758.2
Humidity (50±15 %) : 52.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 11831.0

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	391.0	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	199.4	-0.6	0.00	0.30
400.0	401.2	1.2	0.00	0.30
Average Diff (%)				0.25



Calibrate by: Ydris

Approved by: Piyachon B

วันที่ตรวจ: 00

วันที่อนุมัติ: 02/09/15

เลขที่อนุมัติ: QF-QP16-06

Thai Environmental Technic Limited 1/6 Soi Rantamhaeng 145 Khwaeng/Khet Saphan Sung Bangkok 10240 Thailand
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Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด



Analyzer Calibration Report

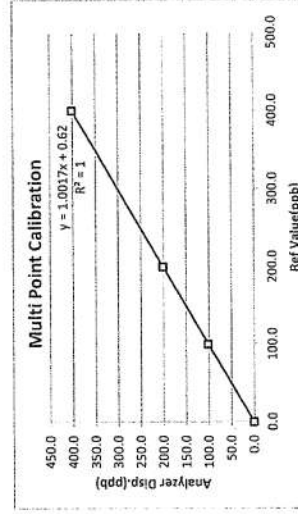
Calibrate Date : 10-May-23
Analyzer Type : SO₂
Brand : API
Model : 100A
Serial Number : 1412 (No. 17)
Range : 500 ppb
Temperature (°C) : 25°C
Barometer (mmHg) : 755.0
Humidity (50±15 %) : 50.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : 118310

Calibration of Span

Supply Gas	Ref Value (ppb)	Before of Span (ppb)	After of Span (ppb)	Abs% diff of Span
Zero	0.0	4.1	0.0	0.0
Span	400.0	392.0	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	101.2	1.2	0.01	1.20
200.0	200.8	0.8	0.00	0.40
400.0	401.3	1.3	0.00	0.33
Average Diff (%)		0.51		



Calibrate by: Y.S.

Approved by: Tiger B

แก้ไขครั้งที่ : 00

วันที่อนุมัติ 02/09/15

เลขที่แบบฟอร์ม : QF-QP16-06

Thai Environmental Technic Limited 1/6 Soi Ramkhamhaeng 145 Khwaeng/Khiet Saphan Sing Bangkok 10240 Thailand
• Tel : +66(0)2373-7799(Auto) Fax : +66(0)2373-7979 • admin@tct1995.com • www.tct1995.com



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

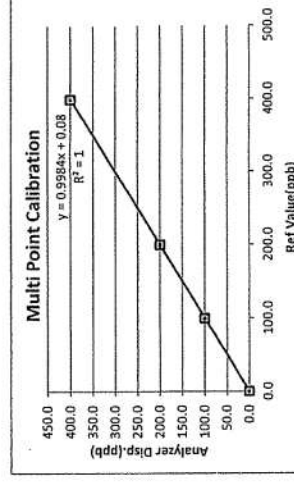
Calibrate Date : 6-Nov-23
Analyzer Type : SO₂
Brand : Thermo
Model : 43C
Serial Number : 43C73374373 (No. 10)
Range : 500 ppb
Temperature (°C) : 25°C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : D636157

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	395.0	400.0	0.0

Multi Point Calibration

Ref Value (ppb)	Analyzer Disp (ppb)	Diff (ppb)	Output Difference	
			Percent Diff	Abs Percent Diff
0.0	0.3	0.3	0.00	0.08
100.0	99.8	-0.2	0.00	0.20
200.0	199.5	-0.5	0.00	0.25
400.0	399.6	-0.4	0.00	0.10
Average Diff (%)		0.16		



Calibrate by: S.S.

Approved by: Parnal M

แก้ไขครั้งที่ : 00

วันที่อนุมัติ 02/09/15

เลขที่แบบฟอร์ม : QF-QP16-06

Thai Environmental Technic Limited 1/6 Soi Ramkhamhaeng 145 Khwaeng/Khiet Saphan Sing Bangkok 10240 Thailand
• Tel : +66(0)2373-7799(Auto) Fax : +66(0)2373-7979 • admin@tct1995.com • www.tct1995.com



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Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

Calibrate Date : 8-Nov-23
Analyzer Type : SC₂
Brand : API
Model : 100E
Serial Number : 1488 (No.13)
Range : 500 ppb

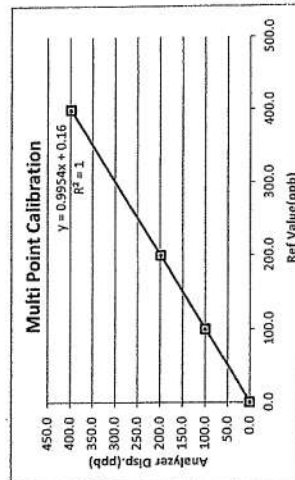
Temperature (°C) : 25°C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.0 %RH
Dilutor : API M700 S/N 625
Zero Air : API M701 S/N 1926
Standard gas : D636157

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	399.0	400.0	0.0

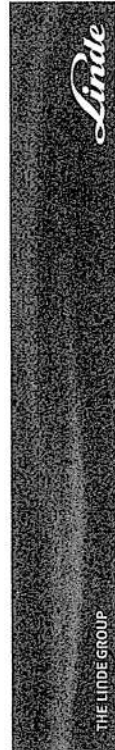
Multi Point Calibration

Ref Value (ppb)	Analyzer Disp (ppb)	Diff (ppb)	Percent Diff	Abs Percent Diff
0.0	0.3	0.3	0.00	0.08
100.0	99.8	-0.2	0.00	0.20
200.0	198.8	-1.2	-0.01	0.60
400.0	398.5	-1.5	0.00	0.38
Average Diff (%)				0.39



Calibrate by: gplm Approved by: Prasat M

วันที่ตรวจวัด : 00
วันที่อนุมัติ : 02/09/15
การเทียบเครื่องมือ : QP-016-06
Thai Environmental Technic Limited 1/5 Soi Raminbhandra 145 Khwaeng/Pat Saphan Sing Bangkok 10240 Thailand
• Tel : +66(0)2373-7199/(Auto) Fax : +66(0)2373-7579 • email: tet1995.com • www.tet1995.com



CERTIFICATE OF ANALYSIS	
Customer Detail: Thai Environmental Technic Ltd	Production Order Number: 90110878 Material Number: 531100-AL-44 Certification Date: 01-Sep-2015 Expiry Date: 01-Sep-2023
Cylinder Description: Aluminum 50 L	Notes: 1. All cylinders are tested in accordance with the relevant standards and are marked with the relevant certification mark. 2. The results are expressed as a single value, unless otherwise specified. The upper limit of variation is indicated by a plus sign (+) and the lower limit by a minus sign (-). 3. The results are expressed as a single value, unless otherwise specified.
Certificate Number: 3064715	Analyst: Prasat
Cylinder Number: D824408	THAI ENVIRONMENTAL
Nominal Cylinder Content: 6.900 MP	Approver: Prasat
Nominal Pressure: 145.0 Bar	STANLEY VAN DIJCK
Valve Outlet: CGA 300 Brass	To Re-Order Please Quote: 531100-AL-44
Comments:	• It is recommended that this product be not used below 5% of actual contents or should not be used when the pressure is below 1 MPa. • Other impurities that affect the analytical conditions of this mixture shall be reported if it is more than 10% of minimum minor component. • Keep and use in well-ventilated and secure area.

Page 1 of 2

บริษัท เทคโนโลยีสิ่งแวดล้อมไทย (จำกัด)
15/15 ถนนรามอินทรา 145 แขวง/เขต สaphan Sing กรุงเทพฯ 10240
เบอร์โทรศัพท์ : 02-373-7199 โทรสาร : 02-373-7579
E-mail: tet1995.com www.tet1995.com

Linde (Thailand) Public Company Limited
15/15 ถนนรามอินทรา 145 แขวง/เขต สaphan Sing กรุงเทพฯ 10240
เบอร์โทรศัพท์ : 02-373-7199 โทรสาร : 02-373-7579
E-mail: tet1995.com www.tet1995.com

CERTIFICATE OF ANALYSIS

Customer Details: Thai Environmental Technic Ltd	Production Order Number: 90110852 Material Number: 43000-AK-44 Certification Date: 01-Sep-2015 Expiry Date: 01-Sep-2023
Cylinder Description: Aluminium 47 L	<p>The measurement of this cylinder, stored in its original factory condition, is suitable for use as National Standard of Mass. The word of the Standard has been printed in its certificate with the U.P.A. Incubator. Printed in U.S. and U.K. for the ASST and a certification of accuracy of the National Standards using procedures of the U.S. and U.K. Incubator, under the same conditions. The reported uncertainty is based on a standard of uncertainty multiplied by coverage factor 1.3, providing a level of confidence of approximately 95%.</p>
Certificate Number: 3063715	<p>Analysis: <i>Printed</i></p> <p>INTERVIEW LOUVE</p>
Cylinder Number: NDD24989	<p>Approval: <i>Alfred</i></p>
Nominal Cylinder Content: 6-480 M³	
Nominal Pressure: 145.0 Bar	
Valve Config: CGA 350 Brass	<p>Signature: <i>Alfred</i></p> <p>Signature: <i>Alfred</i></p>

Comments:

- It is recommended that this product be not used below 55 °F or normal contents or should not be used when its pressure is below 150psi.
- Other impurities that derived by anhydrous ammonia will be report if it is more than 1.0% of minimum minor component.
- Keep and use in well-ventilated and secure area.

CERTIFICATE OF ANALYSIS

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



Reference Standard used in Assay		
Cylinder No.	Concentration	Expiry Date
103998SG	50.02 ± 0.25 ppm	26-Nov-2019
In Nitrogen		

Analytical Instruments used in Assay		
Instrument/Make/Model	Analytical Principle	Last Calibration
Digi LAB Everflow HE Series	FTIR-CO	03-Aug-2015

Method of Analysis	
1.	Standard Addition
2.	Transmittance/FTIR Perm. Analyser
3.	Elemental Chemical Oxygen Analyser
4.	Elemental Chemical Nitrogen Analyser
5.	Isotop Dilution Carbon Analyser
6.	Other specified

Cylinder Number:ND24989	Certification Date:01-Sep-2015
Prediction Order Number:90130852	Expiration Date:01-Sep-2023

CERTIFICATE OF ANALYSIS

<p>Customer Detail: Thai Environmental Technic Ltd.</p>	<p>Cylinder Description: ALU 50 L</p>	<p>Production Order Number: 90137638 Material Number: 498700-AL-44 Certification Date: 11-Oct-2016 Expiry Date: 11-Oct-2024</p>	<p>The measurement of this reference material is traceable to SI through the reference standard which is traceable to Swiss National Standard of Mass. The Assay of this Standard has been performed in accordance with the EPA Traceability Protocol EPA-600/R-12531 for the Assay and Certification of Gas Calibration Standards using procedure G1. The result is expressed on a mole/mole basis, unless otherwise specified. The stated uncertainty is based on a standard uncertainty multiplied by coverage factor k=2, providing a level of confidence of approximately 95%.</p>
<p>Certificate Number: 3112/16</p>	<p>Analyte: </p>	<p>Cylinder Number: D271305</p>	<p>THIRIAT LOYRAT</p>
<p>Nominal Cylinder Content: 6.900 M³</p>	<p>Approve: </p>	<p>Nominal Pressure: 145.0 Bar</p>	<p>SUKANYA KAMUTHARAT</p>
<p>Valve Outlet: CGA 660 SS</p>	<p>To Re-Order Please Quote: 498700-AL-44</p>	<p>Comment:</p>	<ul style="list-style-type: none"> It is recommended that this product be not used below 5% of actual contents or should not be used when its gas pressure is below 150psig. Other impurities that detect by analytical condition of this mixture shall be report if it is more than 10% of minimum minor component. Keep and use in well-ventilated and secure area.

CERTIFICATE OF ANALYSIS

Analytical Result

Component	Request Concentration	Certified Concentration	Certified Uncertainty	Method	Assay Date
Carbon Monoxide	800 ppm	793 ppm	± 1 % relative	(6) I-PB-352	04-Oct & 11-Oct-2016
Sulphur Dioxide	800 ppm	804 ppm	± 1 % relative	(6) I-PB-352	04-Oct & 11-Oct-2016
In Nitrogen					

Reference Standard used in Assay

Reference Standard	Cylinder No.	Concentration	Expired Date
Sulphur Dioxide	118499SG	504.5 ± 2.5 ppm	02-Jul-2018
Carbon Monoxide	113862SG	504.3 ± 1.0 ppm	28-Apr-2019
In Nitrogen			

Analytical Instruments used in Assay

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Digi Lab Ecxidox-HE Series Digi Lab Ecxidox-HE Series	FTIR-CO FTIR-CO	16-Sep-2016 04-Oct-2016

Method of Analysis

1. Gas Chromatograph
2. Paramagnetic Oxygen Analyzer
3. Electrochemical Oxygen Analyzer
4. Electrochemical Moisture Analyzer
5. Total Hydrocarbon Analyzer
6. Other specified

Cylinder Number: D271305
Production Order Number: 99017638
Certification Date: 11-Oct-2016
Expiration Date: 11-Oct-2024

บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

เลขที่ 15 ถนนพหลโยธิน 2/3 หมู่ 14 แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10130

โทรศัพท์: 02-276-1111 โทรสาร: 02-276-1111 โทรสาร: 02-276-1111 โทรสาร: 02-276-1111

เว็บไซต์: www.linde.co.th

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Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

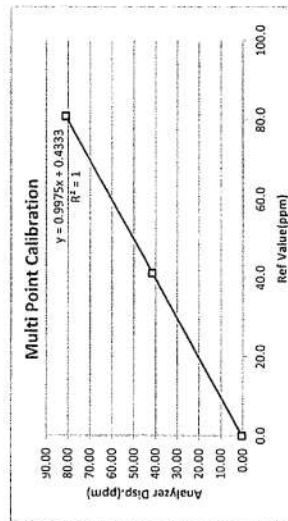
Calibrate Date : 12-May-23
Analyzer Type : CO
Brand : Horiba
Model : APHA 360CE
Serial Number : 42088-7001 (No. 1)
Range : 100 ppm
Temperature (°C) : 26 °C
Barometer (mmHg) : 760
Humidity (50±15 %) : 50.0
Dilutor : API M701 S/N1926
Zero Air : D8244081, ND24989
Standard gas :

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)	Diff (ppm)	Output Difference Percent Diff	Abs Percent Diff
0.0	0.40	0.4	0.00	0.49
41.1	41.50	0.4	0.01	0.97
80.9	81.10	0.2	0.00	0.25
Average Diff (%)				0.57



Calibrate by: yhs

Approved by: Tiyada B

บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

เลขที่ 15 ถนนพหลโยธิน 2/3 หมู่ 14 แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10130

โทรศัพท์: 02-276-1111 โทรสาร: 02-276-1111 โทรสาร: 02-276-1111

เว็บไซต์: www.linde.co.th

โทรสาร: 02-276-1111

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โทรสาร: 02-276-1111

บริษัท ลินด์ (ประเทศไทย) จำกัด (มหาชน)

วันที่พิมพ์: 00

วันที่พิมพ์: 02/09/15

เลขที่พิมพ์: QF-QP16-06

Thai Environmental Technic Limited
1/5 Soi Raminthaniang 145 Khwaeng/Chet Saphan Sing Bangkok 10240 Thailand
Tel : +66(0)2373-7799 (Auto) Fax : +66(0)2373-7799 • admin@let1995.com • www.let1995.com



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

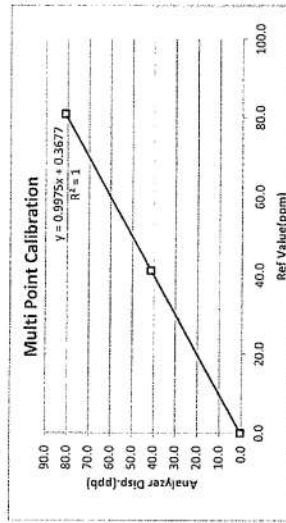
Calibrate Date : 12-May-23
Analyzer Type : CO
Brand : Thermo
Model : 42C
Serial Number : 48062-B46337 (No. 3)
Range : 100 ppm
Temperature (°C) : 25°C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.0
Dilutor : API M700 S/N625
Zero Air : API M701 S/N1926
Standard gas : D824408, ND24989

Calibration of Span

Supply Gas	Ref Value(ppm)	Before of Span(ppm)	After of Span(ppm)	Abs% diff of Span
Zero	0.0	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 by: Y.S.
Approved by: Piyakorn B.

แก้ไขครั้งที่ : 00 วันที่อนุมัติ 02/09/15 เก็บเป็นแบบฟอร์ม : QT-QP16-06

Thai Environmental Technic Limited 1/6 Soi Raminbhaeng 145 Khwaeng Kiet Saphan Sung Bangkok 10240 Thailand
Tel : +66(0)2373-7798 (Auto) Fax : +66(0)2373-7975 admin@tet1995.com www.tet1995.com



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Analyzer Calibration Report

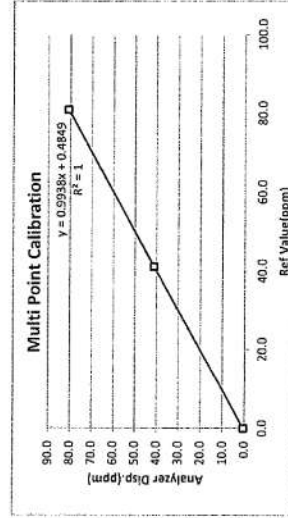
Calibrate Date : 12-May-23
Analyzer Type : CO
Brand : API
Model : 300
Serial Number : 1068
Range : 100 ppm
Temperature (°C) : 25°C
Barometer (mmHg) : 760.0
Humidity (50±15 %) : 50.53RH
Dilutor : API M700 S/N625
Zero Air : API M701 S/N1926
Standard gas : D824408, ND24989

Calibration of Span

Supply Gas	Ref Value(ppm)	Before of Span(ppm)	After of Span(ppm)	Abs% diff of Span
Zero	0.0	2.4	0.0	0.0
Span	80.9	80.7	80.9	0.0

Multi Point Calibration

Ref Value(ppm)	Analyzer Disp.(ppm)	Output Difference		
		Diff (ppm)	Percent Diff	Abs Percent Diff
0.0	0.5	0.5	0.01	0.62
41.1	41.3	0.2	0.00	0.49
80.9	80.9	0.0	0.00	0.00
Average Diff (%)		0.37		



Calibrate by: Y.S.
Approved by: Piyakorn B.

แก้ไขครั้งที่ : 00 วันที่อนุมัติ 02/09/15 เก็บเป็นแบบฟอร์ม : QT-QP16-06

Thai Environmental Technic Limited 1/6 Soi Raminbhaeng 145 Khwaeng Kiet Saphan Sung Bangkok 10240 Thailand
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TET

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Analyzer Calibration Report

Calibrate Date : 10-Nov-23
Analyzer Type : CO
Brand : Horiba
Model : APWA 360CE
Serial Number : 42088-7001 (No.1)
Range : 100 ppm

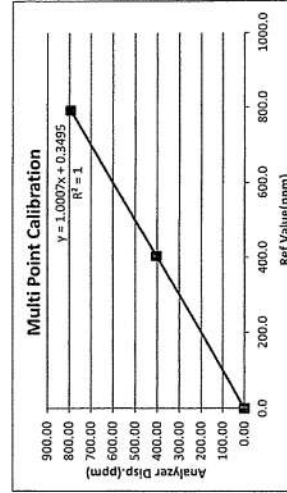
Temperature (°C) : 25°C
Barometer (mmHg) : 760
Humidity (50±15 %) : 50.0 %RH
Dilutor : REF M700 S/N625
Zero Air : API M701 S/N1926
Standard gas : N2O4989, D271305

Calibration of Span

Supply Gas	Ref Value(ppm)	Before of Span(ppm)	After of Span(ppm)	Abs% diff of Span
Zero	0.0	0.45	0.00	0.00
Span	793.0	799.00	793.00	0.00

Multi Point Calibration

Ref Value(ppm)	Analyzer Disp.(ppm)	Output Difference		Abs Percent Diff
		Diff (ppm)	Percent Diff	
0.0	0.42	0.4	0.00	0.05
404.0	404.50	0.5	0.00	0.12
793.0	794.00	1.0	0.00	0.13
Average Diff (%)				0.10



Calibrate by: gahs Approved by: Pornpan M.

แก้ไขครั้งที่ : 00 วันที่อนุมัติ : 02/09/15 เลขที่แบบฟอร์ม : QF-QP16-06

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TET

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Analyzer Calibration Report

Calibrate Date : 10-Nov-23
Analyzer Type : CO
Brand : TyLedyne
Model : 300E
Serial Number : 1066 (No.2)
Range : 100 ppm

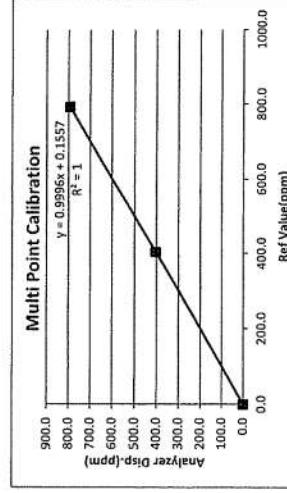
Temperature (°C) : 25°C
Barometer (mmHg) : 760
Humidity (50±15 %) : 50.0 %RH
Dilutor : API M700 S/N625
Zero Air : API M701 S/N1926
Standard gas : N2O4989, D271305

Calibration of Span

Supply Gas	Ref Value(ppm)	Before of Span(ppm)	After of Span(ppm)	Abs% diff of Span
Zero	0.0	1.2	0.0	0.00
Span	793.0	796	793.0	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	0.05
404.0	403.5	-0.5	0.00	0.12
793.0	793.1	0.1	0.00	0.01
Average Diff (%)				0.06



Calibrate by: gahs Approved by: Pornpan M.

แก้ไขครั้งที่ : 00 วันที่อนุมัติ : 02/09/15 เลขที่แบบฟอร์ม : QF-QP16-06

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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 03 / 08 / 66

Calibration 8v $\sqrt{3}m\mu\delta$

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

\bar{X} : Mean
 SD : Standard deviation



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 04 / 10 / 66Calibration By J. H. Smith

Remark : Uncertainty Type A = $\sigma =$ SD

5

= Standard deviation

= Mean



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Personal Pump Calibration Report

Equipment Type : Personal Pump/Parameter

Equipment Range : 0.1-7.0 V/min

Calibration Range : 0.1-4.0 U/min

Calibration Type : Drycal

Calibration S/N : 109698

[illegible]

Calibration Date 02/11/66

Calibration By $\sqrt{pk\sqrt{d}}$

Remark : Uncertainty Type A = $\sigma =$ SD

 \sqrt{n}

= Standard deviation

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

= Mean

Personal Pump Calibration Report

Equipment Type : Personal Pump/Parameter

Equipment Range : 0.1-7.0 V/min

Calibration Range : 0.1-4.0 V/min

Calibration Type : Drycal

Calibration S/N : 109698

[illegible]

Calibration Date 07 / 12 / 66

Calibration By *Source*

Remark : Uncertainty Type A = $\sigma = \text{SD}$

15

= Standard deviation

 \bar{X} = Mean

= Mean

Preventive Maintenance and Performance Report

Methane-NMHC Analyzer

CONFIGURATION TESTED :

MODEL	SERIAL NUMBER	DATE TEST	Due DATE
55C	55C-72555-371	13/01/2023	12/01/2024

Preventive Maintenance List:

- Clean and inspect Analyzer
 - ☒ Unplug power cord from the power source.
 - ☒ Wipe/remove any dust.
 - ☒ Inspect internal connectors for proper contact and placement.
 - ☒ Verify operation of all replaceable parts.
- Restore Analyzer
 - ☒ Restore the normal operating conditions.
 - ☒ Check and record the post PM detector signal output values. Results should be similar or lower than the detector output recorded prior to PM.

Calibration System :

Standard gas				
GASES	Conc.	Cer.No	Cyl. No	Exp. Date
Methane/Propane in Air	2.0 ppm	3099/21	G26810	13/07/23
Methane/Propane in Air	20.0 ppm	2205/22	14M343028	11/07/24
Methane/Propane in Air	200.0 ppm	3504/20	66309	09/08/24

Environmental : Temperature 25.0°C. Humidity 51 %RM

Test Results Table :

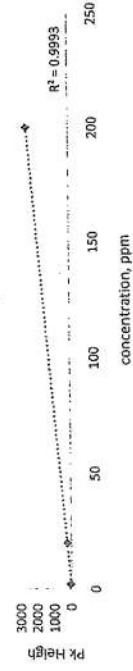
The calibration was performed following the triple point by Standard gas mixed Methane-Propane in Air at concentration 2, 20 and 200 ppm and verified by Standard gas mixed Methane-Propane in Air as following :

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
					Evaluated (≤ 2 %)
					pass
					pass
					pass
					pass
					pass

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 Approve by Phornip Phetsee
(Mr. Tewapong Chueywatkoa) (Mrs. Phornip Phetsee)
Scientist Laboratory Manager
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
5341 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL 0-2717-3000-29 FAX 0-2719-0484



Cert.No.: 23CH0644
Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH1300
Serial No. : B06D0012
ID No. : Ins-LAB-026
Condition As-Received: Used Item
Received Date : 31 October 2023
Calibration Date : 01 November 2023
Reference : 2310-084300C-7
Submitted by :
Thai Environmental Technic Limited
1/6 Soi Ramkhamhaeng 145,
Khwaeng/Khet Saphan Sung,
Bangkok 10240
Laboratory (Thai Environment Technic Limited)
Calibration Place :
Ambient Temperature : (25.4 - 24.2) °C
Relative Humidity : (69.3 - 66.7) %
Calibration Procedure :
In - house method :
- CP-OCH2 by direct measurement with standard
voltage calibrator and direct measurement
with certified reference material (CRM)
Calibrated by :
Khiti Rullanaprapachai

Saithip
Approved Signatory

Approved by :
(✓) Saithip Meangmai
() Warakorn Lenggratrakul
() Ponpan Palpin

Issue Date : 10 November 2023

The Uncertainties are for a confidence probability of approximately 95%.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL: 0-2717-3000-29 FAX: 0-2719-9484



Cert. No.: 23TM673
Page : 1 of 3

Certificate of Calibration

Equipment : BOD Incubator
Manufacturer : Accuplus
Model : i250
Serial No. : 0408-0115-0008
ID No. : TET.LAB.BOD05

Submitted by : Thal Environmental Technic Limited
1/6 Soi Ramkhamhaeng 145,
Khwang/Khet Saphan Sung,
Bangkok 10240
Location : Laboratory (Thal Environmental Technic Limited)

Received Order : 10 April 2023
Calibration Date : 11 April 2023
Ambient Temperature : $(26 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$

Calibrated by : Khit Rutlanaprapachai

Approved by : 
Approved Signatory

() Ponthippa Tameyakul
() Malee Bulkuea
() Suwit Injai

Issue Date : 25 April 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 0053455



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2304-0148OC-2
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 :-

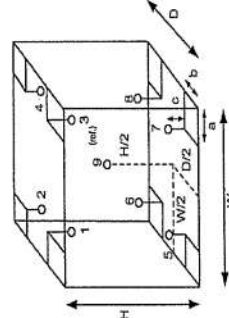
Instrument : Model : Serial No. : Due Date :
1) Data Acquisition 34972A MY57013711 02 Jul 2023
2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available

Environment during calibration	
Beginning	Finished
Temp. (°C)	26
REL.Humid. (%)	54
AC Supply (Volt)	221



Probe Installation Details :

a = 10 cm
b = 10 cm
c = 10 cm
D = 0.48 m
W = 0.50 m
H = 1.1 m
Capacity = 0.28 m³

Position :	Ref. Std. ID No.:
1	18-18RTD-01
2	18-18RTD-02
3	18-18RTD-03
4	18-18RTD-04
5	18-18RTD-05
6	18-18RTD-06
7	18-18RTD-07
8	22-18RTD-08
9 (ref.)	18-18RTD-09



a 1158205



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2304-01460C-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

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	1.1	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
20.0	Position									9 (ref.)
	1	2	3	4	5	6	7	8	9	
	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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Valu

a 1158204



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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5344 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10550
TEL. 0-2717-3000-29 FAX. 0-2719-9484



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

Certificate of Calibration

Equipment : Spectrophotometer
Manufacturer : Perkin Elmer
Model : Lambda 365
Serial No. : 365K9042909
ID No. :
Condition As-Received :
Received Date : 18 August 2023
Calibration Date : 18 August 2023
Reference : 2308-04690C-1
Submitted by : Thai Environmental Technic Limited
1/6 Soi Ramkhamhaeng 145,
Khwaeng/Khet Saphan Sung,
Bangkok 10240
Laboratory (Thai Environment Technic Limited)
Ambient Temperature : (25.5 - 25.3) °C (On-Site)
Relative Humidity : (57.8 - 60.6) % (On-Site)
Calibration Procedure : In - house method :
CP-OCH4 based on ASTM E 275-01

Calibrated by : Kunchit Promprat

Approved by : Sailipo
Approved Signatory

(✓) Sailhip Meangmai
() Warakorn Lemgagrakul
() Porpan Paipin

Issue Date : 22 August 2023

The Uncertainties are for a confidence probability of approximately 95%

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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 :

- Starna 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
638.00	637.64	0.14	2.05
684.50	684.49	0.13	2.00
879.41	879.42	0.12	2.00

Satish

a 1176586



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
546.1	Zero 0.5224 0.6856 0.9837	-0.0001 0.5209 0.6839 0.9921	0.0028 0.0028 0.0028 0.0028	2.00 2.00 2.00 2.00
635.0	Zero 0.5387 0.6832 0.9886	-0.0001 0.5375 0.6810 0.9861	0.0028 0.0028 0.0028 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 260.74 nm \pm 0.11 nm
- Result = Pass, If Absorbance > 2.00 Abs and Transmission < 1.0 %T at Wavelength 260.74 nm \pm 0.11 nm
- * : 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 %.

-000-

Satish

a 1176585



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TEL. 0-2717-3000-29 FAX. 0-2719-9454



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 : $(28 \pm 10) ^\circ\text{C}$
Relative Humidity : $(50 \pm 30) \%$

Calibrated by : Man Pattanasongpalboon

Approved by :
Approved Signatory

(/) Ponthippa Tameyakul
(/) Malee Bulkruea
() Suwit Injai

Issue Date : 25 April 2023

The Uncertainties are for a confidence probability of approximately 95%

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

A 0053457



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2304-01460C-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 : 34970A
Serial No. : MY41021843
Cert. No. : 22LM772
Due Date : 27 Dec 2023

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

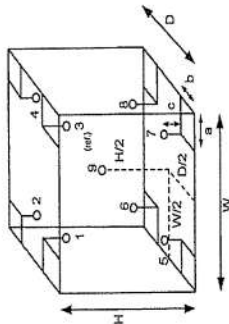
3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close

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



Probe Installation Details :

a = 5.0 cm
b = 5.0 cm
c = 5.0 cm
D = 0.40 m
W = 0.58 m
H = 0.48 m
Capacity = 0.11 m³

Dimension of Chamber :

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

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
35.0	35.0	35.0	0.065	0.32	0.67	2
41.5	41.5	41.5	0.032	0.49	0.63	2
44.5	44.5	44.5	0.086	0.60	0.86	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
35.0	34.870	34.847	34.722	34.860	34.744	35.047	34.842	35.288	35.026	0.30
41.5	41.625	41.612	41.461	41.733	41.300	41.428	41.418	41.874	41.758	0.30
44.5	44.744	44.708	44.553	44.852	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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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0197

MTC No. EEL-BP. 60/0166

CALIBRATION CERTIFICATE

Submitted by : THAI ENVIRONMENTAL TECHNIC LIMITED.

Address : 1/6 Soi Ramkhamhaeng 145, Khwaeng/Kiet Saphansung, 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 : Tenmars

Model : TM-100

Serial No. : 181203570

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

2. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

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

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

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

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

7. Condenser Microphone 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

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.

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Fax. (66) 0 2323 7165
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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

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

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FM.BL.MTC.002 Rev.4



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 :

(Mr. Weerachai Deechaiyae)

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

End of Certificate

Ref : 2011266011000062001

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.

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FM.BL.MTC.002 Rev.4



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. : 181203570

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		ก่อนปรับ ครั้งที่ 1	ก่อนปรับ ครั้งที่ 2	ก่อนปรับ ครั้งที่ 3			
18	ACO	6226	070046	94.1	94.1	94.1	94.0	0.1	PASS
19	ACO	6226	070047	93.9	93.9	93.9	94.0	0.1	PASS
20	ACO	6226	070048	94.2	94.2	94.2	94.0	0.2	PASS
21	ACO	6226	070049	93.8	93.8	93.8	94.0	0.2	PASS
23	RION	NL-21	00487676	94.2	94.2	94.2	94.0	0.2	PASS
25	ACO	6226	100098	94.3	94.3	94.3	94.0	0.3	PASS
26	ACO	6226	100099	94.1	94.1	94.1	94.0	0.1	PASS
28	ACO	6226	100101	93.9	93.9	93.9	94.0	0.1	PASS
29	ACO	6226	100102	94.3	94.3	94.3	94.0	0.3	PASS
30	ACO	6226	100106	94.2	94.2	94.2	94.0	0.2	PASS

Calibration By :

Approve by : Ramwut 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. : 181203570

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		ก่อนปรับ ครั้งที่ 1	ก่อนปรับ ครั้งที่ 2	ก่อนปรับ ครั้งที่ 3			
51	ACO	6226	152077	94.1	94.1	94.1	94.0	0.1	PASS
52	ACO	6226	150142	93.9	93.9	93.9	94.0	0.1	PASS
53	ACO	6226	160095	93.9	93.9	93.9	94.0	0.1	PASS
54	ACO	6226	160096	93.9	93.9	93.9	94.0	0.1	PASS
55	ACO	6226	160097	93.9	93.9	93.9	94.0	0.1	PASS
56	ACO	6226	160098	94.1	94.1	94.1	94.0	0.1	PASS
57	ACO	6226	160099	93.8	93.8	93.8	94.0	0.2	PASS
58	ACO	6226	160143	93.9	93.9	93.9	94.0	0.1	PASS
59	ACO	6226	160203	94.1	94.1	94.1	94.0	0.1	PASS
60	ACO	6226	160204	94.3	94.3	94.3	94.0	0.3	PASS

Calibration By :

Approve by : Ramwut 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 $\pm 1\%$
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
Dued 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		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 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
66	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	222036	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 : 94.0 ± 0.3 dB and 114.0 ± 0.5 dB
Frequency : at 1,000 Hz $\pm 1\%$
Calibrator Serial NO. : 181203570
Calibration Date : 24-July-2023
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23 \pm 3) $^{\circ}$ C : 25.8 $^{\circ}$ C
Relative Humidity (50 \pm 5 %) : 45.0 % RH
Dued Date of Calibrate : 31-Aug-2023

Item	Instrument Calibrated		Reference Acoustic dB	Before Adjust			After Adjust \pm dB	Deviation \pm dB	Result Calibrate
	Brand	Model		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3			
18	ACO	6226	070046	94.1	94.1	94.1	94.0	0.1	PASS
19	ACO	6226	070047	94.1	94.1	94.1	94.0	0.1	PASS
20	ACO	6226	070048	93.9	93.9	93.9	94.0	0.1	PASS
21	ACO	6226	070049	94.2	94.2	94.2	94.0	0.2	PASS
23	RION	NL-21	00487676	93.9	93.9	93.9	94.0	0.1	PASS
25	ACO	6226	100088	94.1	94.1	94.1	94.0	0.1	PASS
26	ACO	6226	100089	93.9	93.9	93.9	94.0	0.1	PASS
28	ACO	6226	100101	93.9	93.9	93.9	94.0	0.1	PASS
29	ACO	6226	100102	94.1	94.1	94.1	94.0	0.1	PASS
30	ACO	6226	100106	94.2	94.2	94.2	94.0	0.2	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 : 94.0 ±0.3 dB and 114.0±0.5 dB
Frequency : at 1,000 Hz ±1%
Calibrator Serial NO. : 181203570

Calibration Date : 24-July-2023
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23±3)°C : 25.8 °C
Relative Humidity(50±5 %) : 45.0 % RH
Dued Date of Calibrate : 31-Aug-2023

Item	Instrument Calibrated		Reference Acoustic dB	Before Adjust			After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3			
41	ACO	6226	130127	94.1	94.1	94.1	94.0	0.1	PASS
42	ACO	6226	130128	94.0	94.0	94.0	94.0	0.0	PASS
43	ACO	6226	130129	94.0	94.0	94.0	94.0	0.0	PASS
44	ACO	6226	130130	94.0	93.9	93.9	94.0	0.1	PASS
45	ACO	6226	130131	94.0	94.2	94.2	94.0	0.2	PASS
46	ACO	6236	112029	94.0	94.3	94.3	94.0	0.3	PASS
47	ACO	6236	152073	94.0	93.9	93.9	94.0	0.1	PASS
48	ACO	6236	152074	94.0	94.2	94.2	94.0	0.2	PASS
49	ACO	6236	152075	94.0	94.3	94.3	94.0	0.3	PASS
50	ACO	6236	152076	94.0	93.8	93.8	94.0	0.2	PASS

Calibration By :

Approve by :

[Signature]

[Signature]



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. : 181203570

Calibration Date : 24-July-2023
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23±3)°C : 25.8 °C
Relative Humidity(50±5 %) : 45.0 % RH
Dued Date of Calibrate : 31-Aug-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	6226	152077	93.7	93.7	93.7	94.0	0.3	PASS
52	ACO	6226	150142	94.0	93.9	93.9	94.0	0.1	PASS
53	ACO	6226	100095	94.0	94.1	94.1	94.0	0.1	PASS
54	ACO	6226	100096	94.0	93.9	93.9	94.0	0.1	PASS
55	ACO	6226	160097	94.0	94.0	94.0	94.0	0.0	PASS
56	ACO	6226	160098	94.0	93.9	93.9	94.0	0.1	PASS
57	ACO	6226	160099	94.0	94.0	94.0	94.0	0.0	PASS
58	ACO	6226	160143	94.0	94.0	94.0	94.0	0.0	PASS
59	ACO	6226	160203	94.0	93.9	93.9	94.0	0.1	PASS
60	ACO	6226	160204	94.0	94.1	94.1	94.0	0.1	PASS

Calibration By :

Approve by :

[Signature]

[Signature]



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-Aug-2023
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23 \pm 3) $^{\circ}$ C : 25.6 $^{\circ}$ C
Relative Humidity(50 \pm 15 %) : 50.0 % RH
Dued Date of Calibrate : 30-Sep-2023

Item	Instrument Calibrated		Reference Acoustic dB	Before Adjust			After Adjust \pm dB	Deviation \pm dB	Result Calibrate
	Brand	Model		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3			
18	ACO	6226	070046	94.0	94.1	94.1	94.0	0.1	PASS
19	ACO	6226	070047	114.0	114.0	114.0	114.0	0.0	PASS
20	ACO	6226	070048	94.0	94.2	94.2	94.0	0.2	PASS
21	ACO	6226	070049	114.0	114.1	114.1	114.1	0.1	PASS
22	ACO	6226	070050	94.0	94.2	94.2	94.0	0.2	PASS
23	ACO	6226	070051	114.0	114.1	114.1	114.1	0.1	PASS
24	ACO	6226	070052	94.0	94.2	94.2	94.0	0.2	PASS
25	ACO	6226	070053	114.0	114.1	114.1	114.1	0.1	PASS
26	ACO	6226	070054	94.0	94.2	94.2	94.0	0.2	PASS
27	ACO	6226	070055	114.0	114.1	114.1	114.1	0.1	PASS
28	ACO	6226	070056	94.0	94.2	94.2	94.0	0.2	PASS
29	ACO	6226	070057	114.0	114.1	114.1	114.1	0.1	PASS
30	ACO	6226	070058	94.0	94.2	94.2	94.0	0.2	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-Aug-2023
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23 \pm 3) $^{\circ}$ C : 25.6 $^{\circ}$ C
Relative Humidity(50 \pm 15 %) : 50.0 % RH
Dued Date of Calibrate : 30-Sep-2023

Item	Instrument Calibrated		Reference Acoustic dB	Before Adjust			After Adjust \pm dB	Deviation \pm dB	Result Calibrate
	Brand	Model		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3			
41	ACO	6226	130127	94.0	94.2	94.2	94.0	0.2	PASS
42	ACO	6226	130128	114.0	114.1	114.1	114.1	0.1	PASS
43	ACO	6226	130129	94.0	93.9	93.9	94.0	0.1	PASS
44	ACO	6226	130130	114.0	113.8	113.8	114.0	0.2	PASS
45	ACO	6226	130131	94.0	94.3	94.3	94.0	0.3	PASS
46	ACO	6226	130132	114.0	114.2	114.2	114.2	0.2	PASS
47	ACO	6226	130133	94.0	94.1	94.1	94.0	0.1	PASS
48	ACO	6226	130134	114.0	114.1	114.1	114.1	0.1	PASS
49	ACO	6226	130135	94.0	94.1	94.1	94.0	0.1	PASS
50	ACO	6226	130136	114.0	114.1	114.1	114.1	0.1	PASS

Calibration By :

Approve by :



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type : Sound Level Meter Calibration Date : 24-Sep-2023
Calibrator : TENMARS Sound Calibrator TM-100 Barometric pressure (mmHg) : 759.0 mmHg
Standard : IEC 60942 Temperature (23±3)°C : 25.60 °C
Accuracy : 94.0 ±0.3 dB and 114.0±0.5 dB Relative Humidity(50±15 %) : 50.0 % RH
Frequency : at 1,000 Hz ±1% Dued Date of Calibrate : 31-Oct-2023
Calibrator Serial NO. : 181203570

Item	Instrument Calibrated		Reference Acoustic dB	Before Adjust			After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3			
31	ACO	6226	110098	94.2	94.2	94.2	94.0	0.2	PASS
32	ACO	6226	110105	94.1	94.1	94.1	94.0	0.1	PASS
33	ACO	6226	110096	93.9	93.9	93.9	94.0	0.1	PASS
34	ACO	6226	110099	94.1	94.1	94.1	94.0	0.1	PASS
35	ACO	6226	110097	93.7	93.7	93.7	94.0	0.3	PASS
36	ACO	6226	110102	94.2	94.2	94.2	94.0	0.2	PASS
37	ACO	6226	110101	94.1	94.1	94.1	94.0	0.1	PASS
38	ACO	6226	110106	93.9	93.9	93.9	94.0	0.1	PASS
39	ACO	6226	110104	94.1	94.1	94.1	94.0	0.1	PASS
40	ACO	6228	110100	93.9	93.9	93.9	94.0	0.1	PASS

Calibration By :

Approve by :

(Signature)

(Signature)

1



Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type : Sound Level Meter Calibration Date : 24-Sep-2023
Calibrator : TENMARS Sound Calibrator TM-100 Barometric pressure (mmHg) : 759.0 mmHg
Standard : IEC 60942 Temperature (23±3)°C : 25.60 °C
Accuracy : 94.0 ±0.3 dB and 114.0±0.5 dB Relative Humidity(50±15 %) : 50.0 % RH
Frequency : at 1,000 Hz ±1% Dued Date of Calibrate : 31-Oct-2023
Calibrator Serial NO. : 181203570

Item	Instrument Calibrated		Reference Acoustic dB	Before Adjust			After Adjust ± dB	Deviation ± dB	Result Calibrate
	Brand	Model		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3			
41	ACO	6226	130127	94.1	94.1	94.1	94.0	0.1	PASS
42	ACO	6226	130128	93.9	93.9	93.9	94.0	0.1	PASS
43	ACO	6226	130129	94.1	94.1	94.1	94.0	0.1	PASS
44	ACO	6226	130130	94.1	94.1	94.1	94.0	0.1	PASS
45	ACO	6226	130131	94.2	94.2	94.2	94.0	0.2	PASS
46	ACO	6236	112029	94.1	94.1	94.1	94.0	0.1	PASS
47	ACO	6236	152073	93.8	93.8	93.8	94.0	0.2	PASS
48	ACO	6236	152074	93.9	93.9	93.9	94.0	0.1	PASS
49	ACO	6236	152075	94.2	94.2	94.2	94.0	0.2	PASS
50	ACO	6236	152076	93.8	93.8	93.8	94.0	0.2	PASS

Calibration By :

Approve by :

(Signature)

(Signature)



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. : 181203570

Calibration Date : 24-Oct-2023
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23±3)°C : 25.60 °C
Relative Humidity(50±15 %) : 50.0 % RH
Dued Date of Calibrate : 30-Nov-2023

Item	Instrument Calibrated		Reference Acoustic dB	Before Adjust			After Adjust		Deviation ± dB	Result Calibrate
	Brand	Model		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย	เฉลี่ย		
51	ACO	6226	152077	94.0	94.0	94.0	94.0	94.0	0.0	PASS
52	ACO	6226	150142	94.0	94.1	94.1	94.1	94.1	0.1	PASS
53	ACO	6226	160095	94.0	93.9	93.9	93.9	93.9	0.1	PASS
54	ACO	6226	160096	94.0	93.9	93.9	93.9	93.9	0.1	PASS
55	ACO	6226	160097	94.0	93.9	93.9	93.9	93.9	0.1	PASS
56	ACO	6226	160098	94.0	94.2	94.2	94.2	94.2	0.2	PASS
57	ACO	6226	160099	94.0	94.1	94.1	94.1	94.1	0.1	PASS
58	ACO	6226	160143	94.0	94.1	94.1	94.1	94.1	0.1	PASS
59	ACO	6226	160203	94.0	93.8	93.8	93.8	93.8	0.2	PASS
60	ACO	6226	160204	94.0	94.1	94.1	94.1	94.1	0.1	PASS

Calibration By :

Approve by :

[Signature]
[Signature]



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. : 181203570

Calibration Date : 24-Oct-2023
Barometric pressure (mmHg) : 759.0 mmHg
Temperature (23±3)°C : 25.60 °C
Relative Humidity(50±15 %) : 50.0 % RH
Dued Date of Calibrate : 30-Nov-2023

Item	Instrument Calibrated		Reference Acoustic dB	Before Adjust			After Adjust		Deviation ± dB	Result Calibrate
	Brand	Model		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3	เฉลี่ย	เฉลี่ย		
41	ACO	6226	130127	94.0	94.1	94.1	94.1	94.1	0.1	PASS
42	ACO	6226	130128	94.0	94.2	94.2	94.2	94.2	0.2	PASS
43	ACO	6226	130129	94.0	94.3	94.3	94.3	94.3	0.3	PASS
44	ACO	6226	130130	94.0	94.1	94.1	94.1	94.1	0.1	PASS
45	ACO	6226	130131	94.0	93.9	93.9	93.9	93.9	0.1	PASS
46	ACO	6226	112029	94.0	94.1	94.1	94.1	94.1	0.1	PASS
47	ACO	6226	152073	94.0	93.9	93.9	93.9	93.9	0.1	PASS
48	ACO	6226	152074	94.0	94.2	94.2	94.2	94.2	0.2	PASS
49	ACO	6226	152075	94.0	93.9	93.9	93.9	93.9	0.1	PASS
50	ACO	6226	152076	94.0	94.0	94.0	94.0	94.0	0.0	PASS

Calibration By :

Approve by :

[Signature]
[Signature]



TET

Thai Environmental Technic Limited
บริษัท เทคโนโลยีสิ่งแวดล้อมไทย จำกัด

Sound Level Meter Calibration Report

Equipment Type : Sound Level Meter Calibration Date : 25-Nov-2023
Calibrator : TENMARS Sound Calibrator TM-100 Barometric pressure (mmHg) : 759.0 mmHg
Standard : IEC 60942 Temperature (23±3)°C : 23.60 °C
Accuracy : 94.0 ±0.3 dB and 114.0±0.3 dB Relative Humidity(50±15 %) : 50.0 % RH
Frequency : at 1,000 Hz ±1% Dued Date of Calibrate : 31-Dec-2023
Calibrator Serial NO. : 181203570

Item	Instrument Calibrated		Reference Acoustic dB	Before Adjust			After Adjust ± dB	Deviation ± dB	Result
	Brand	Model		ครั้งที่ 1	ครั้งที่ 2	ครั้งที่ 3			
18	ACO	6226	070046	94.2	94.2	94.2	94.0	0.2	PASS
19	ACO	6226	070047	114.0	114.1	114.1	114.1		
20	ACO	6226	070048	94.0	94.2	94.2	94.0	0.2	PASS
21	ACO	6226	070049	114.0	114.2	114.2	114.2		
22	ACO	6226	070048	94.0	93.7	93.7	93.7	0.3	PASS
23	ACO	6226	070049	114.0	113.7	113.7	113.7		
24	ACO	6226	070048	94.0	94.2	94.2	94.0	0.2	PASS
25	ACO	6226	070049	114.0	114.1	114.1	114.1		
26	ACO	6226	070048	94.0	93.9	93.9	94.0	0.1	PASS
27	ACO	6226	070049	114.0	113.8	113.8	113.8		
28	ACO	6226	070048	94.0	93.8	93.8	94.0	0.2	PASS
29	ACO	6226	070049	114.0	113.9	113.9	113.9		
30	ACO	6226	070048	94.0	94.1	94.1	94.0	0.1	PASS
31	ACO	6226	070049	114.0	114.1	114.1	114.1		
32	ACO	6226	070048	94.0	94.0	94.0	94.0	0.0	PASS
33	ACO	6226	070049	114.0	113.9	113.9	113.9		
34	ACO	6226	070048	94.0	94.1	94.1	94.0	0.1	PASS
35	ACO	6226	070049	114.0	114.1	114.1	114.1		
36	ACO	6226	070048	94.0	93.9	93.9	94.0	0.1	PASS
37	ACO	6226	070049	114.0	113.9	113.9	113.9		

Calibration By :

Approve by :



SP METROLOGY SYSTEM (THAILAND) CO.,LTD.



Certificate of Calibration

Certificate Number : SPR22090243-7 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
Manufacturer : Instanitel
Model : Micromate
Serial Number : UM12176
ID. Number : No.8
Environmental Conditions
Ambient Temperature : 23 °C ± 3 °C Received Date : 14 Sep 2022
Relative Humidity : 50 % ± 15 % Calibration Date : 19 Sep 2022
Location of Calibration : In-Lab Recommend Due Date : 19 Sep 2023
Calibration Procedure : In-House Method Date of Issue : 20 Sep 2022

Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs.
All calibrations are performed within manufacture's specifications. The calibration certificate shall not be reproduced except in full without written approval of SP Metrology System (Thailand).

Calibrated by : Mr. Munin Khumpum Approved by :
Calibration Officer (Ms. Bussakorn Chalkaew)
Authorized Signatory



Calibration Report

Certificate Number : SPR22090243-7

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due Date
ICP Accelerometer	353B04	LW231796	45941	13 Nov 2022

Traceability

This certification is traceable to the International System of Unit maintained at :
PTB - Physikalisch Technische Bundesanstalt, Germany



Result of Calibration

Certificate No. : SPR22090243-7

Page : 3 of 3

Frequency Response Performance Test @ 1 mm/s

Frequency (Hz)	STD Reading	UUC Reading	Error	Uncertainty (±)
20.0	1.001	1.012	0.011	0.042
40.0	1.002	1.014	0.012	0.042
50.0	1.002	1.010	0.008	0.042
80.0	1.001	1.015	0.014	0.042
100.0	1.001	1.019	0.018	0.042
160.0	1.003	1.017	0.014	0.042
200.0	1.002	1.014	0.012	0.042

Linearity Performance Test

Frequency (Hz)	STD Reading	UUC Reading	Error	Uncertainty (±)
100	0.501	0.514	0.013	0.041
	1.003	1.020	0.017	0.042
	1.502	1.516	0.014	0.044
	2.003	2.018	0.015	0.047
	3.003	3.014	0.011	0.053
	5.003	5.015	0.012	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 : 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 : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ Received Date : 13 Jan 2023
Relative Humidity : $50\% \pm 15\%$ 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 Knumpum

Approved by :

Calibration Officer

(Ms. Bussakorn Chaikaew)

Authorized Signatory

SP-FM-04-15 rev.0



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-0060-20	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 : 3 of 4

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

Geophone P/N 721A3301 Functional Performance Test @180Hz

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

Frequency (Hz)	STD Reading	UUC Reading	Error	Uncertainty (±)
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

Unit : mm/s



Result of Calibration

Certificate No. :

SPR23010143-4

Page : 4 of 4

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

Linearity Performance Test

Unit : m/s²

Frequency (Hz)	STD Reading	UUC Reading	Error	Uncertainty (±)
160.0	0.502	0.506	0.004	0.0060
160.0	1.003	1.010	0.007	0.012
160.0	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%.

- End of Certificate -



Certificate of Calibration

Certificate Number : SPR23090333-3
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	: 721A2601/721A3301
Serial Number	: UM12176UM20454
ID. Number	: No.8
Environmental Conditions	
Ambient Temperature	: 23 °C ± 3 °C
Relative Humidity	: 50 % ± 15 %
Location of Calibration	: In-Lab
Calibration Procedure	: In-House Method
Received Date	: 20 Sep 2023
Calibration Date	: 25 Sep 2023
Recommend Due Date	: 25 Sep 2024
Date of Issue	: 26 Sep 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
Calibration Officer
Approved by : 
(Mr. Nirut Loha)
Authorized Signatory



Calibration Report

Certificate Number : SPR23090333-3

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Vibration Calibrator	VC-02	2007014	AV-0050-20	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. : SPR23090333-3

Page : 3 of 3

Sensor model : 725A3301 S/N : UM20454

Frequency Response Performance Test @ 1 mm/s

Frequency (Hz)	STD Reading	UUC. Reading	Error	Uncertainty (\pm)
20.0	1.002	0.982	-0.020	0.042
40.0	1.002	0.981	-0.021	0.042
50.0	1.002	0.985	-0.017	0.042
80.0	1.001	0.984	-0.017	0.042
100.0	1.002	0.987	-0.015	0.042
160.0	1.003	0.989	-0.014	0.042
200.0	1.003	0.988	-0.015	0.042

Linearity Performance Test

Frequency (Hz)	STD Reading	UUC. Reading	Error	Uncertainty (\pm)
100	0.501	0.490	-0.011	0.041
	1.001	0.982	-0.019	0.042
	1.502	1.478	-0.024	0.044
	2.002	1.971	-0.031	0.047
	3.002	2.968	-0.034	0.053
	5.003	4.962	-0.041	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 —