

ภาคผนวก ง.

เอกสารสอบเทียบเครื่องมือตรวจวัด



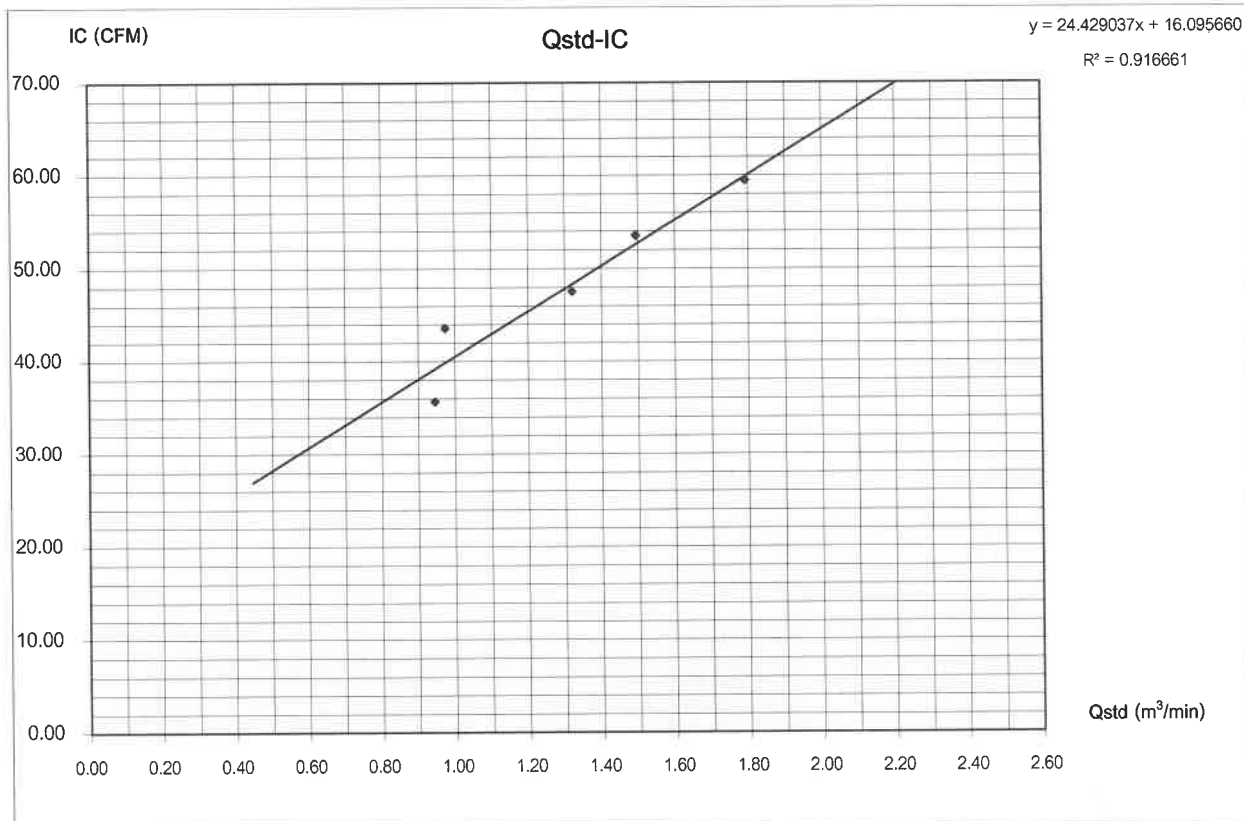
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Calibration Location				Date	October 11, 2024
Stack Consulting Co.,Ltd				Start Time	9:00 AM
Sampler Number	TSP No.1	Transfer Standard Type	Orifice	Stop Time	9:30 AM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Jeerawat Promsaengsai
Motor Serial Number	TSP No.1	Calibrator Serial Number	2618		
Recorder Serial Number	TSP No.1				

Plate	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop
No.	Pressure Drop Across Orifice (inH ₂ O)			[ΔH ₂ O(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	Qstd = {1/m}[(A-b)]	ample Flow Rate Indication	C = [(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	(*K = °C+273)	Pressure	Meter	Meter
	Positive	Negative	ΔH ₂ O								
5	1.6	1.6	3.2	1.77344	0.94570	36.0	35.69	304.0	762.0		
7	2.0	1.4	3.4	1.82802	0.97426	44.0	43.62	304.0	762.0		
10	3.2	3.1	6.3	2.48835	1.31989	48.0	47.59	304.0	762.0		
13	4.1	4.0	8.1	2.82153	1.49428	54.0	53.53	304.0	762.0		
18	6.0	5.7	11.7	3.39106	1.79238	60.0	59.48	304.0	762.0		
Linear Regression Y ON X : Y= mX + b							Average	304.0	762.0		
1	Slope (m)			1.91052	Linear Equation			r ²	0.916661	Pstd(mmHg)	760.0
2	Intercept (b)			-0.03333	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9574241	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99998	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.982842798
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.991384284

COMMENT

Andersen Instruments, Inc.



Checked By K.Thongchai
(Mr.Thongchai khaisuban)
Technician



Approved By Thanyalak worakrut
(Miss.Thanyalak worakrut)
Academician



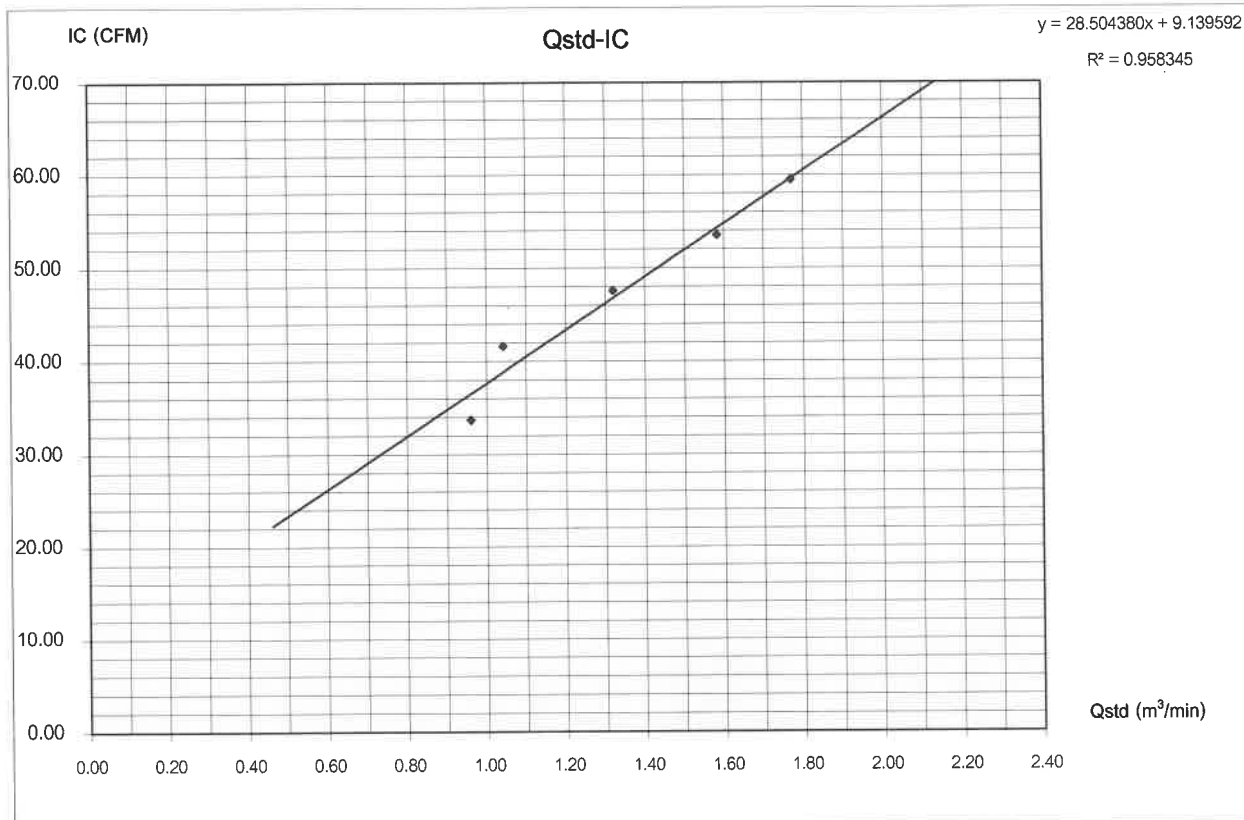
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Calibration Location				Date	October 11, 2024
Stack Consulting Co.,Ltd				Start Time	10:00 AM
Sampler Number	TSP No.2	Transfer Standard Type	Orifice	Stop Time	10:30 AM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Jeerawat Promsaengsai
Motor Serial Number	TSP No.2	Calibrator Serial Number	2618		
Recorder Serial Number	TSP No.2				

Plate	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop	
No.	Pressure Drop Across Orifice (inH ₂ O)			[ΔH ₂ O(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	Qstd = (1/m)[(A-b)] (m ³ /min)	ample Flow Rate Indicato (ft ³ /min)	IC = [[(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	(°K = °C+273)	Pressure (mmHg)	Meter	Meter	
	Positive	Negative	ΔH ₂ O									
5	1.6	1.7	3.3	1.80094	0.96009	34.0	33.71	304.0	762.0			
7	2.0	1.9	3.9	1.95783	1.04221	42.0	41.64	304.0	762.0			
10	3.2	3.1	6.3	2.48835	1.31989	48.0	47.59	304.0	762.0			
13	4.1	5.0	9.1	2.99063	1.58279	54.0	53.53	304.0	762.0			
18	6.0	5.4	11.4	3.34730	1.76948	60.0	59.48	304.0	762.0			
Linear Regression Y ON X : Y= mX + b							Average	304.0	762.0			
1	Slope (m)			1.91052	Linear Equation			r ²	0.958345	Pstd(mmHg)	760.0	
2	Intercept (b)			-0.03333	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.978951	T _{NTP}	298.0	
3	Correlation Coefficient (r)			0.99998	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.982842798		
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.991384284	

COMMENT

Andersen Instruments, Inc.



Checked By R.Thongchai
(Mr.Thongchai khaisuban)
Technician



Approved By Thanyalak
(Miss.Thanyalak worakrut)
Academician



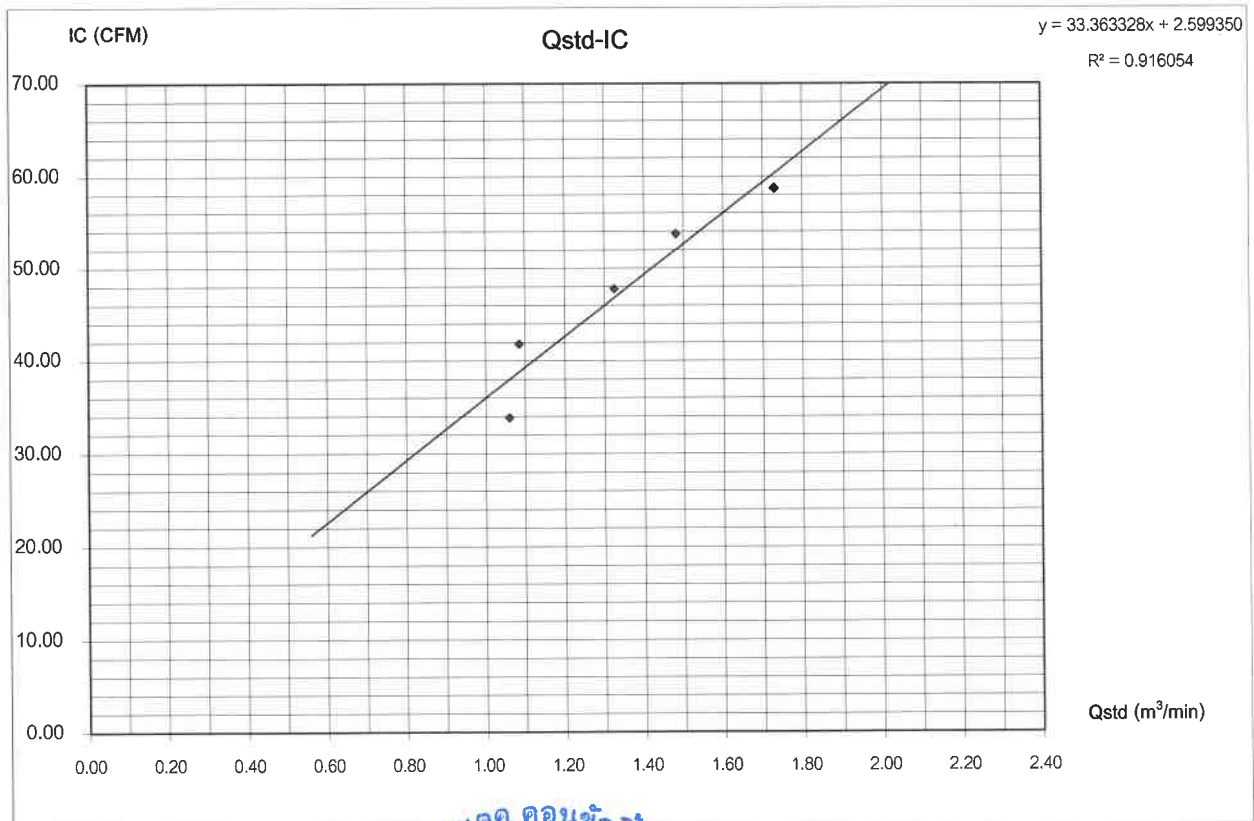
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Calibration Location				Date	October 11, 2024
Stack Consulting Co.,Ltd				Start Time	9:30 AM
Sampler Number	TSP No.3	Transfer Standard Type	Orifice	Stop Time	10:00 AM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Aekaiti Wapeekang
Motor Serial Number	TSP No.3	Calibrator Serial Number	2618		
Recorder Serial Number	TSP No.3				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Pressure Drop Across Orifice (inH ₂ O)			[ΔH ₂ O(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	Qstd = (1/m)[(A-b)] (m ³ /min)	ample Flow Rate Indication (ft ³ /min)	IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	(°K = °C+273)	(mmHg)		
	Positive	Negative	ΔH ₂ O								
5	2.2	1.8	4.0	1.99063	1.05938	34.0	33.84	302.0	763.0		
7	2.3	1.9	4.2	2.03979	1.08511	42.0	41.80	302.0	763.0		
10	3.3	3.0	6.3	2.49822	1.32506	48.0	47.78	302.0	763.0		
13	3.9	4.0	7.9	2.79752	1.48172	54.0	53.75	302.0	763.0		
18	5.4	5.4	10.8	3.27094	1.72951	59.0	58.72	302.0	763.0		
Linear Regression Y ON X : Y= mX + b							Average	302.0	763.0		
1	Slope (m)			1.91052	Linear Equation			r ²	0.916054	Pstd(mmHg)	760.0
2	Intercept (b)			-0.03333	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9571071	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99998	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.990650052	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.995314047	

COMMENT

Andersen Instruments, Inc.



Checked By K.Thongchai
(Mr.Thongchai khlaisuban)
Technician



Approved By Thanyalak
(Miss.Thanyalak worakrut)
Academician



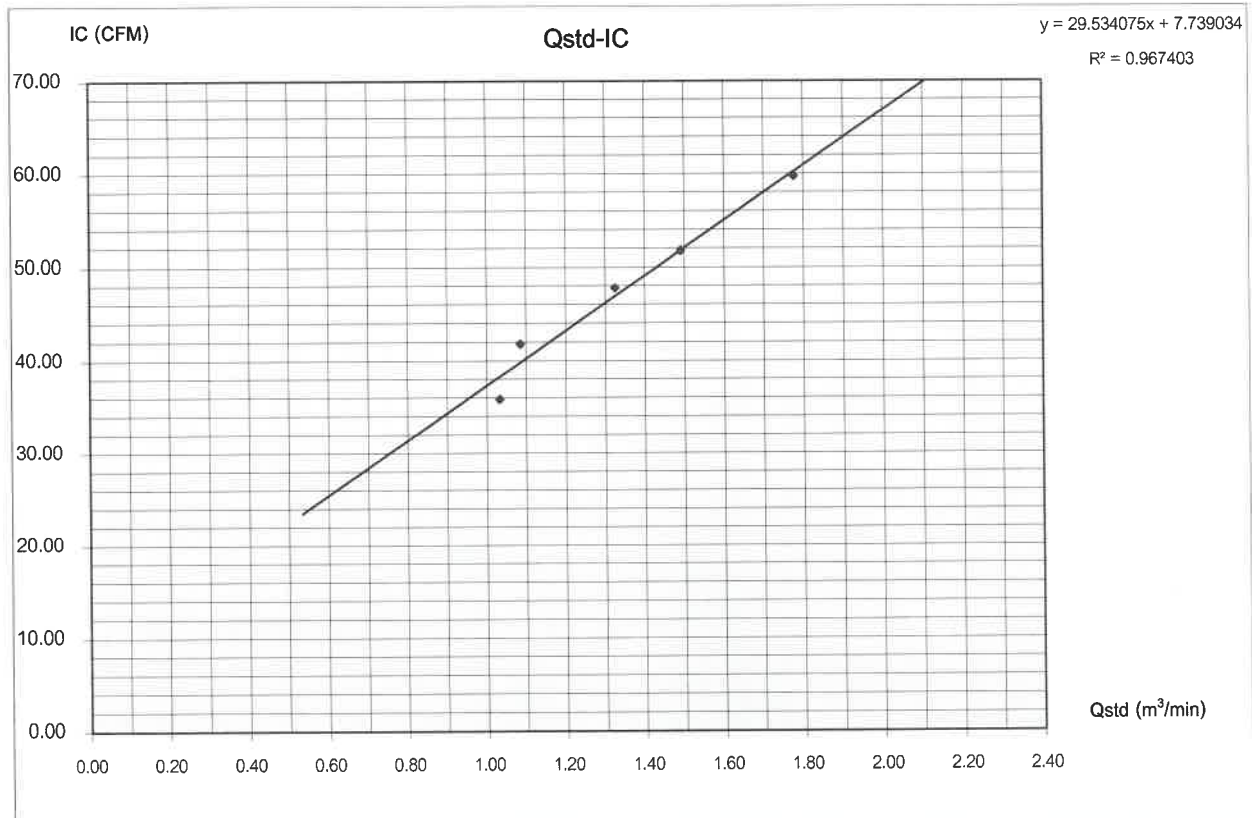
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Calibration Location				Date	October 11, 2024
Stack Consulting Co.,Ltd				Start Time	10:30 AM
Sampler Number	TSP No.4	Transfer Standard Type	Orifice	Stop Time	11:00 AM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Aekaitti Wapeekang
Motor Serial Number	TSP No.4	Calibrator Serial Number	2618		
Recorder Serial Number	TSP No.4				

Plate	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop
No.	Pressure Drop Across Orifice (InH ₂ O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	Qstd = (1/m)[(A-b)] (m ³ /min)	ample Flow Rate Indication (ft ³ /min)	IC = $[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	(°K = °C+273)	Pressure (mmHg)	Meter	Meter
	Positive	Negative	ΔH ₂ O								
5	2.0	1.8	3.8	1.94022	1.03299	36.0	35.83	302.0	763.0		
7	2.3	1.9	4.2	2.03979	1.08511	42.0	41.80	302.0	763.0		
10	3.3	3.0	6.3	2.49822	1.32506	48.0	47.78	302.0	763.0		
13	4.0	4.0	8.0	2.81517	1.49096	52.0	51.76	302.0	763.0		
18	6.0	5.4	11.4	3.36057	1.77643	60.0	59.72	302.0	763.0		
Linear Regression Y ON X : Y= mX + b							Average	302.0	763.0		
1	Slope (m)			1.91052	Linear Equation			r ²	0.967403	Pstd(mmHg)	760.0
2	Intercept (b)			-0.03333	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9835665	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99998	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.990650052
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.995314047

COMMENT

Andersen Instruments, Inc.



Checked By K. Thongchai
(Mr.Thongchai khlaisuban)
Technician



Approved By Thanyalak worakrut
(Miss.Thanyalak worakrut)
Academician



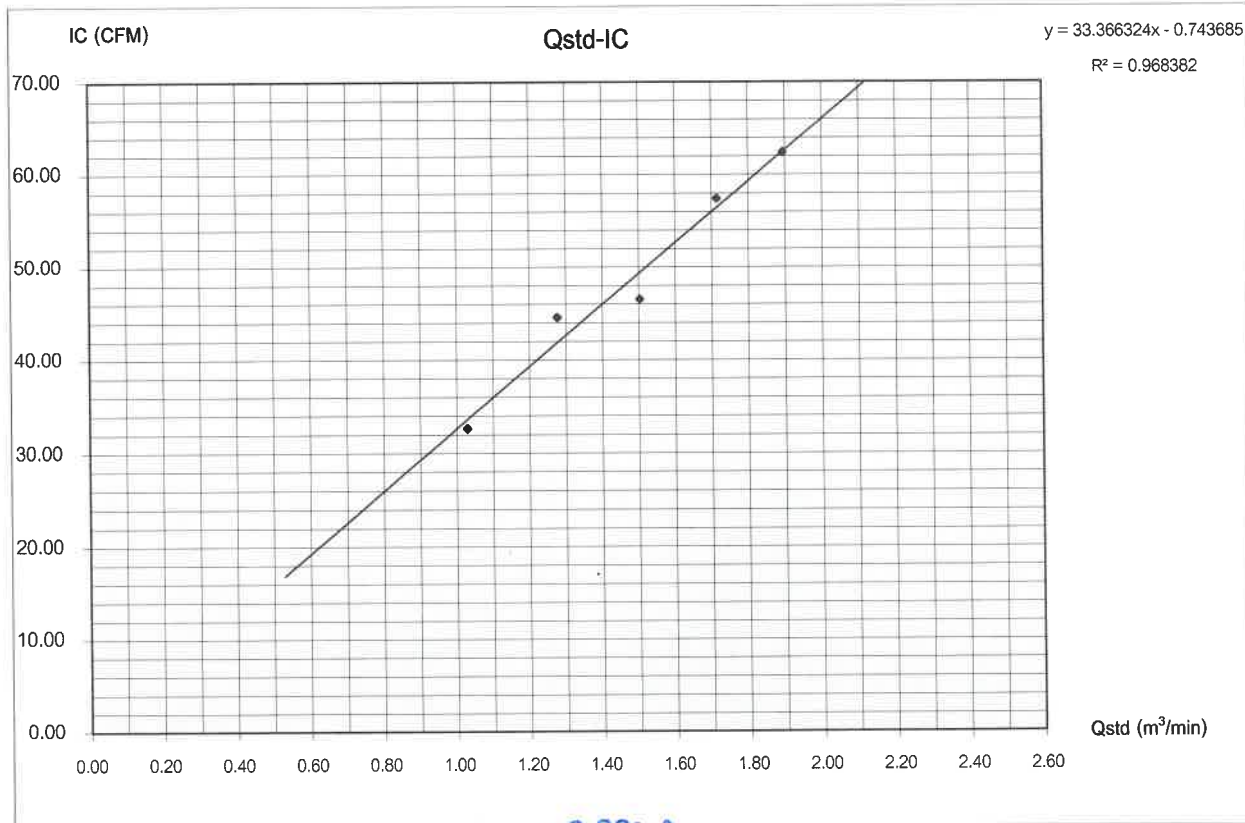
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Calibration Location				Date	October 11, 2024
Stack Consulting Co.,Ltd				Start Time	9:00 AM
Sampler Number	PM-10 No.1	Transfer Standard Type	Orifice	Stop Time	9:30 AM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Aekaitti Wapeekang
Motor Serial Number	PM-10 No.1	Calibrator Serial Number	2618		
Recorder Serial Number	PM-10 No.1				

Plate	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop
No.	Pressure Drop Across Orifice (lnH ₂ O)			[ΔH ₂ O(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	Qstd = (1/m)[(A-b)]	ample Flow Rate Indication	IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	(*K = °C+273)	Pressure	Meter	Meter
	Positive	Negative	ΔH ₂ O								
5	2.0	1.8	3.8	1.93130	1.02832	33.0	32.69	302.0	756.0		
7	3.0	2.9	5.9	2.40649	1.27705	45.0	44.58	302.0	756.0		
10	4.2	4.0	8.2	2.83704	1.50240	47.0	46.56	302.0	756.0		
13	5.7	5.0	10.7	3.24079	1.71373	58.0	57.46	302.0	756.0		
18	6.8	6.3	13.1	3.58587	1.89435	63.0	62.42	302.0	756.0		
Linear Regression Y ON X : Y= mX + b							Average	302.0	756.0		
1	Slope (m)			1.91052	Linear Equation			r ²	0.968382	Pstd(mmHg)	760.0
2	Intercept (b)			-0.03333	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.984064	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99998	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.98156152
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.990737866

COMMENT

Andersen Instruments, Inc.



Checked By K.Thongchai
(Mr.Thongchai khaisuban)
Technician



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(Miss.Thanyalak worakrut)
Academician



บริษัท สแตค คอนซัลติ้ง จำกัด
Stack Consulting Co.,Ltd.

บริษัท สแตค คอนซัลติ้ง จำกัด
14/3504-3505 หมู่ 14 ตำบลบางบัวทอง อำเภอบางบัวทอง
จังหวัดนนทบุรี 11110 โทร. 02-922-6573

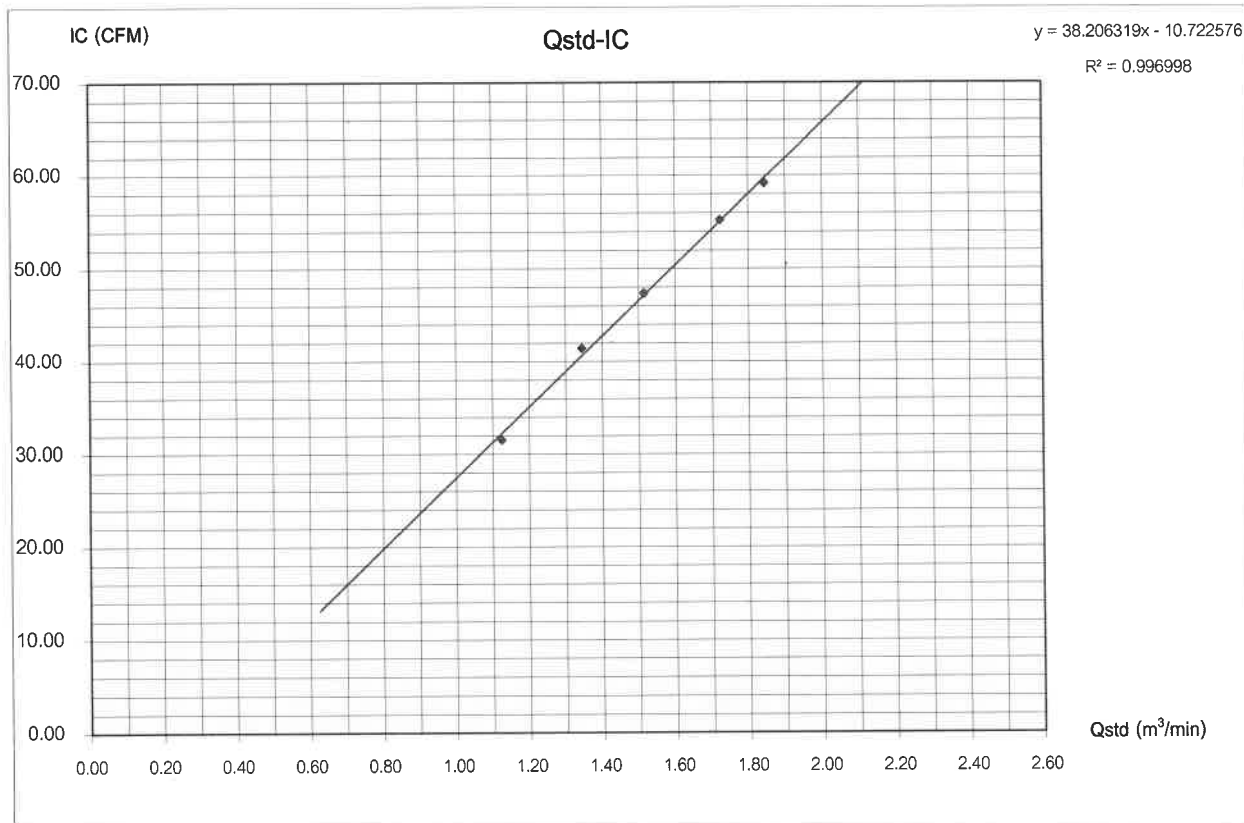
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Calibration Location				Date	October 11, 2024
Stack Consulting Co.,Ltd				Start Time	9:00 AM
Sampler Number	PM-10 No.2	Transfer Standard Type	Orifice	Stop Time	9:30 AM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Aekaitti Wapeekang
Motor Serial Number	PM-10 No.2	Calibrator Serial Number	2618		
Recorder Serial Number	PM-10 No.2				

Plate	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop
No.	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	Qstd = (1/m)[(A-b)] (m ³ /min)	ample Flow Rate Indicato (ft ³ /min)	IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	(*K = °C+273)	Pressure (mmHg)	Meter	Meter
	Positive	Negative	ΔH ₂ O								
5	2.0	2.6	4.6	2.11649	1.12526	32.0	31.58	304.0	755.0		
7	3.4	3.2	6.6	2.53519	1.34441	42.0	41.45	304.0	755.0		
10	4.0	4.4	8.4	2.86008	1.51446	48.0	47.37	304.0	755.0		
13	5.7	5.2	10.9	3.25800	1.72274	56.0	55.26	304.0	755.0		
18	6.5	6.0	12.5	3.48894	1.84362	60.0	59.21	304.0	755.0		
Linear Regression Y ON X : Y= mX + b							Average	304.0	755.0		
1	Slope (m)			1.91052	Linear Equation			r ²	0.996998	Pstd(mmHg)	760.0
2	Intercept (b)			-0.03333	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9984979	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99998	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.973814058
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.986820175

COMMENT

Andersen Instruments, Inc.



Checked By K.Thongchai
(Mr.Thongchai khlaisuban)
Technician



Approved By Thanyalak worakrut
(Miss.Thanyalak worakrut)
Academician



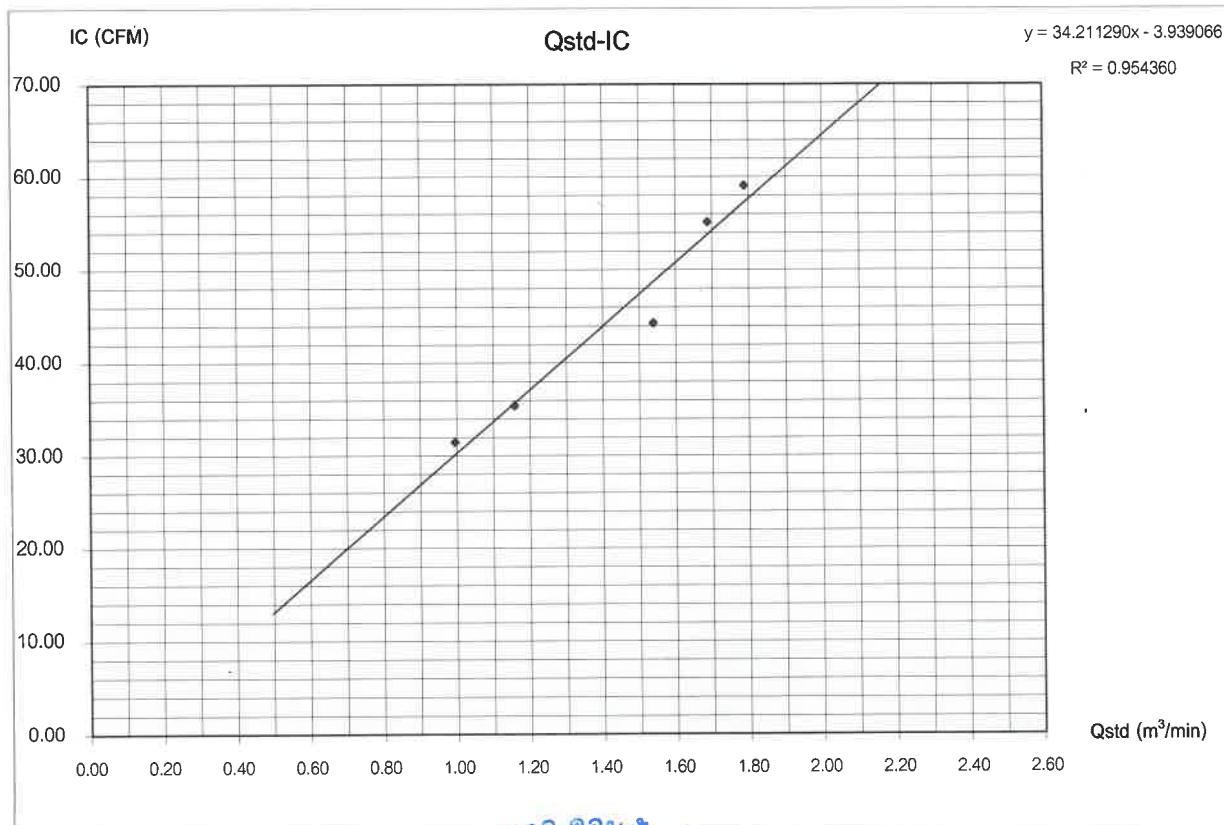
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Calibration Location Stack Consulting Co.,Ltd				Date	October 11, 2024
				Start Time	10:00 AM
Sampler Number	PM-10 No.3	Transfer Standard Type	Orifice	Stop Time	10:30 AM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Aekaiti Wapeekang
Motor Serial Number	PM-10 No.3	Calibrator Serial Number	2618		
Recorder Serial Number	PM-10 No.3				

Plate	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop
No.	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	Qstd = (1/m)[(A-b)] (m ³ /min)	ample Flow Rate Indication (ft ³ /min)	IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	(*K = °C+273)	Pressure (mmHg)	Meter	Meter
	Positive	Negative	ΔH ₂ O								
5	1.6	2.0	3.6	1.86864	0.99552	32.0	31.52	304.0	752.0		
7	2.5	2.4	4.9	2.18008	1.15854	36.0	35.45	304.0	752.0		
10	4.0	4.7	8.7	2.90491	1.53793	45.0	44.32	304.0	752.0		
13	5.2	5.3	10.5	3.19130	1.68783	56.0	55.15	304.0	752.0		
18	6.4	5.4	11.8	3.38310	1.78822	60.0	59.09	304.0	752.0		
Linear Regression Y ON X : Y= mX + b							Average	304.0	752.0		
1	Slope (m)			1.91052	Linear Equation			r ²	0.95436	Pstd(mmHg)	760.0
2	Intercept (b)			-0.03333	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9769135	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99998	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.969944598
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.984857654

COMMENT

Andersen Instruments, Inc.



Checked By K.Thongchai
(Mr.Thongchai khaisuban)
Technician



Approved By Thanyalak
(Miss.Thanyalak worakrut)
Academician



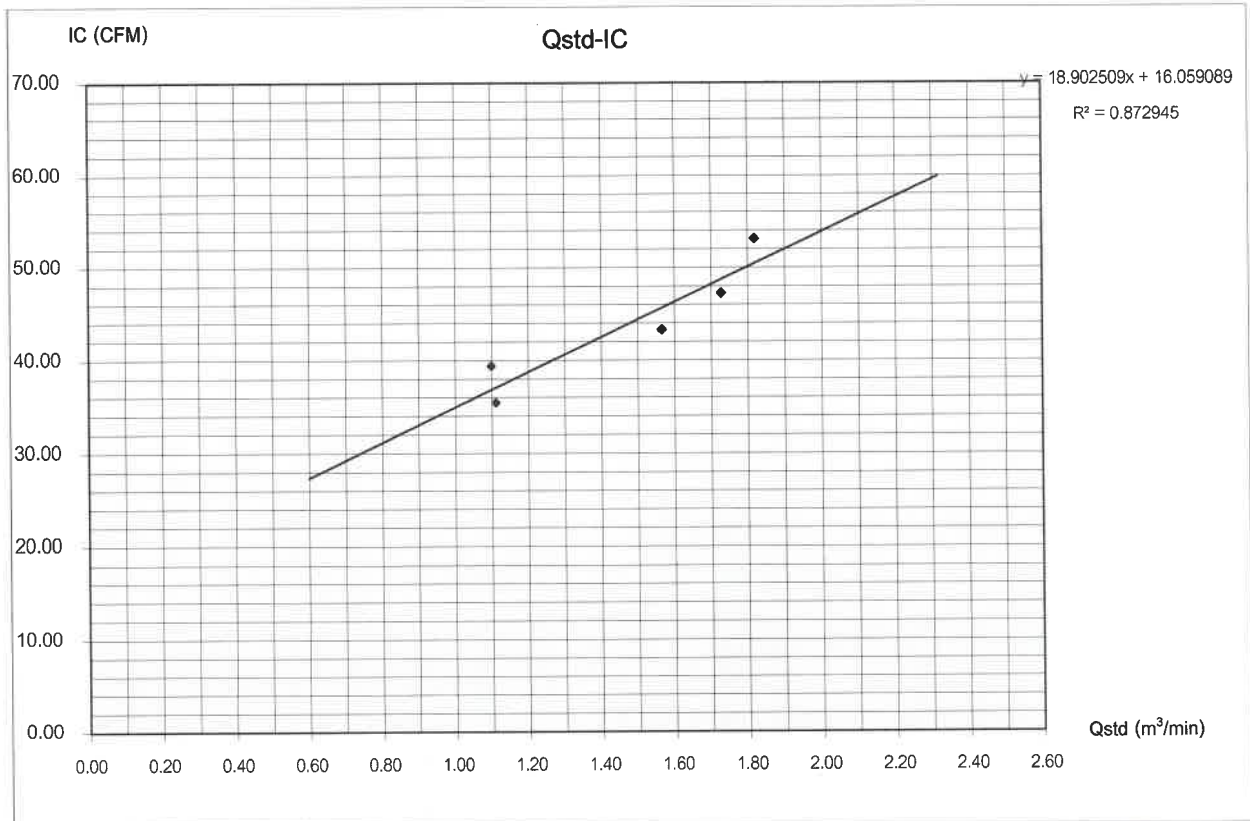
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Calibration Location				Date	October 11, 2024
Stack Consulting Co.,Ltd				Start Time	10:00 AM
Sampler Number	PM-10 No.4	Transfer Standard Type	Orifice	Stop Time	10:30 AM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Jeerawat Promsaengsai
Motor Serial Number	PM-10 No.4	Calibrator Serial Number	2618		
Recorder Serial Number	PM-10 No.4				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Positive	Negative	ΔH_2O	$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m ³ /min)	Sample Flow Rate Indicator (ft ³ /min)	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	(°K = °C+273)	(mmHg)		
5	2.6	1.9	4.5	2.08920	1.11097	36.0	35.45	304.0	752.0		
7	2.0	2.4	4.4	2.06585	1.09875	40.0	39.39	304.0	752.0		
10	4.1	4.9	9.0	2.95457	1.56392	44.0	43.33	304.0	752.0		
13	5.7	5.3	11.0	3.26640	1.72714	48.0	47.27	304.0	752.0		
18	6.2	6.0	12.2	3.43996	1.81798	54.0	53.18	304.0	752.0		
Linear Regression Y ON X : Y= mX + b							Average	304.0	752.0		
1	Slope (m)			1.91052	Linear Equation			r ²	0.872945	Pstd(mmHg)	760.0
2	Intercept (b)			-0.03333	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9343153	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99998	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.969944598
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.984857654

COMMENT

Andersen Instruments, Inc.



Checked By K. Thongchai
(Mr.Thongchai khaisuban)
Technician



Approved By [Signature]
(Miss.Thanyalak worakrut)
Academician



บริษัท สแตค คอนซัลติ้ง จำกัด
Stack Consulting Co.,Ltd.

บริษัท สแตค คอนซัลติ้ง จำกัด
14/3504-3505 หมู่ 14 ตำบลบางบัวทอง อำเภอบางบัวทอง
จังหวัดนนทบุรี 11110 โทร. 02-922-6573

Calibration Worksheet

Instrument Calibration

Equipment	PM2.5 Sampler	Customer Name	Stack Consulting Co.,Ltd.
Manufacture	BGI Instruments	Location	Stack Consulting
Model	BGI Omni FRM	Scientist	Thongchai
Serial No.	250	Calibration Date	February 5, 2025

Instruments for Calibrator

Instruments	Manufacture	Model	Serial Number
Primary Flow Calibration	MesaLabs	DeltaCal	208893
Date of Calibrator Cal.	2/7/2024		
Calibrator Cal Due Date	2/7/2025		

Calibration Data

AMBIENT TEMPERATURE (°C)		
AS Found 31.6	Calibrator Reading 30.7	As Left 30.7
BAROMETRIC PRESSURE (mmHg)		
AS Found 756	Calibrator Reading 757.5	As Left 758
FLOW RATE (lpm)		
AS Found 4.92	Calibrator Reading 5.00	As Left 5.00

This Certifies that the instrument check above has been calibrated by suggestion operation of manufacture.
At the date of calibration, the instrument was within it operating specifications.

Calibrate By :

K. Thongchai

Mr.Thongchai khlaisuban

February 5, 2025





บริษัท สแตค คอนซัลติ้ง จำกัด
Stack Consulting Co.,Ltd.

บริษัท สแตค คอนซัลติ้ง จำกัด
14/3504-3505 หมู่ 14 ตำบลบางบัวทอง อำเภอบางบัวทอง
จังหวัดนนทบุรี 11110 โทร. 02-922-6573

Calibration Worksheet

Instrument Calibration

Equipment	PM2.5 Sampler	Customer Name	Stack Consulting Co.,Ltd.
Manufacture	BGI Instruments	Location	Stack Consulting
Model	BGI Omni FRM	Calibrate By	Mr. Aekaiti Wapeekang
Serial No.	158	Calibration Date	October 11, 2024

Instruments for Calibrator

Instruments	Manufacture	Model	Serial Number
Primary Flow Calibration	MesaLabs	DeltaCal	208893
Date of Calibrator Cal.	2/7/2024		
Calibrator Cal Due Date	2/7/2025		

Calibration Data

AMBIENT TEMPERATURE (°C)		
AS Found 30.9	Calibrator Reading 30.5	As Left 30.5
BAROMETRIC PRESSURE (mmHg)		
AS Found 756	Calibrator Reading 757.5	As Left 758
FLOW RATE (lpm)		
AS Found 4.99	Calibrator Reading 5.00	As Left 5.00

This Certifies that the instrument check above has been calibrated by suggestion operation of manufacture.
At the date of calibration, the instrument was within it operating specifications.



บริษัท สแตค คอนซัลติ้ง จำกัด
Stack Consulting Co.,Ltd.

บริษัท สแตค คอนซัลติ้ง จำกัด
14/3504-3505 หมู่ 14 ตำบลบางบัวทอง อำเภอบางบัวทอง
จังหวัดนนทบุรี 11110 โทร. 02-922-6573

Calibration Worksheet

Instrument Calibration

Equipment	PM2.5 Sampler	Customer Name	Stack Consulting Co.,Ltd.
Manufacture	BGI Instruments	Location	Stack Consulting
Model	BGI Omni FRM	Calibrate By	Mr. Aekaitti Wapeekang
Serial No.	159	Calibration Date	October 11, 2024

Instruments for Calibrator

Instruments	Manufacture	Model	Serial Number
Primary Flow Calibration	MesaLabs	DeltaCal	208893
Date of Calibrator Cal.	2/7/2024		
Calibrator Cal Due Date	2/7/2025		

Calibration Data

AMBIENT TEMPERATURE (°C)		
AS Found 32.7	Calibrator Reading 30.2	As Left 30.2
BAROMETRIC PRESSURE (mmHg)		
AS Found 755	Calibrator Reading 757.5	As Left 758
FLOW RATE (lpm)		
AS Found 4.96	Calibrator Reading 5.00	As Left 5.00

This Certifies that the instrument check above has been calibrated by suggestion operation of manufacture.
At the date of calibration, the instrument was within it operating specifications.



Calibration Worksheet

Instrument Calibration

Equipment	PM2.5 Sampler	Customer Name	Stack Consulting Co.,Ltd.
Manufacture	BGI Instruments	Location	Stack Consulting
Model	BGI Omni FRM	Calibrate By	Mr. Aekaiti Wapeekang
Serial No.	161	Calibration Date	October 11, 2024

Instruments for Calibrator

Instruments	Manufacture	Model	Serial Number
Primary Flow Calibration	MesaLabs	DeltaCal	208893
Date of Calibrator Cal.	2/7/2024		
Calibrator Cal Due Date	2/7/2025		

Calibration Data

AMBIENT TEMPERATURE (°C)		
AS Found 30.7	Calibrator Reading 30.2	As Left 30.2
BAROMETRIC PRESSURE (mmHg)		
AS Found 755	Calibrator Reading 757.5	As Left 758
FLOW RATE (lpm)		
AS Found 4.95	Calibrator Reading 5.00	As Left 5.00

This Certifies that the instrument check above has been calibrated by suggestion operation of manufacture.
At the date of calibration, the instrument was within it operating specifications.



บริษัท สแตค คอนซัลติ้ง จำกัด
Stack Consulting Co.,Ltd.

บริษัท สแตค คอนซัลติ้ง จำกัด
14/3504-3505 หมู่ 14 ตำบลบางบัวทอง อำเภอบางบัวทอง
จังหวัดนนทบุรี 11110 โทร. 02-922-6573

Calibration Worksheet

Instrument Calibration

Equipment	PM2.5 Sampler	Customer Name	Stack Consulting Co.,Ltd.
Manufacture	BGI Instruments	Location	Stack Consulting
Model	BGI Omni FRM	Scientist	Thongchai
Serial No.	250	Calibration Date	February 5, 2025

Instruments for Calibrator

Instruments	Manufacture	Model	Serial Number
Primary Flow Calibration	MesaLabs	DeltaCal	208893
Date of Calibrator Cal.	2/7/2024		
Calibrator Cal Due Date	2/7/2025		

Calibration Data

AMBIENT TEMPERATURE (°C)		
AS Found 31.6	Calibrator Reading 30.7	As Left 30.7
BAROMETRIC PRESSURE (mmHg)		
AS Found 756	Calibrator Reading 757.5	As Left 758
FLOW RATE (lpm)		
AS Found 4.92	Calibrator Reading 5.00	As Left 5.00

This Certifies that the instrument check above has been calibrated by suggestion operation of manufacture.
At the date of calibration, the instrument was within it operating specifications.

Calibrate By :

K. Thongchai

Mr.Thongchai khlaisuban

February 5, 2025





Analyzer Performance Test

Calibrated Date: October 11, 2024

Instruments Information

Analyzer Type: SO2 Analyzer Model: Electron Corporation	Manufacturer Thermo S/N: 0335804030
--	--

Calibration System

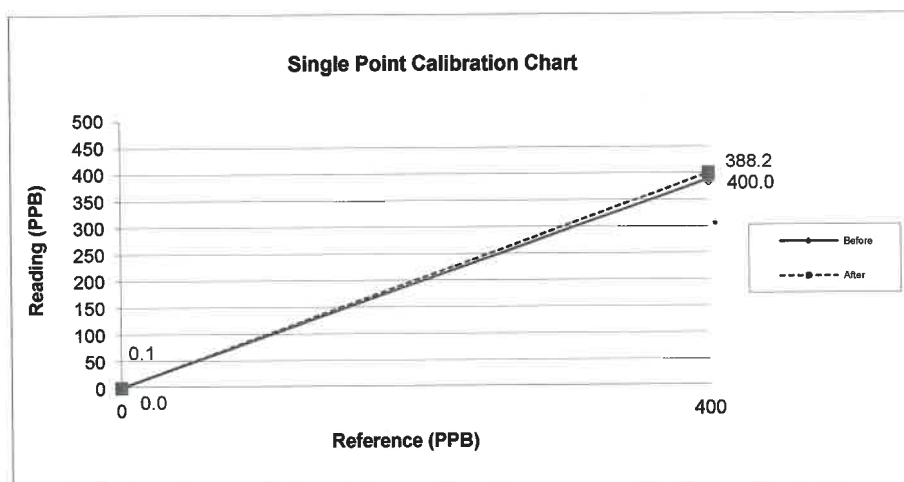
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	388.2	-3.0
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

K.Thongchai
Mr.Thongchai Khaisuban





Analyzer Performance Test

Calibrated Date: October 11, 2024

Instruments Information

Analyzer Type: SO2 Analyzer Model: Electron Corporation	Manufacturer Thermo S/N: 0527613260
--	--

Calibration System

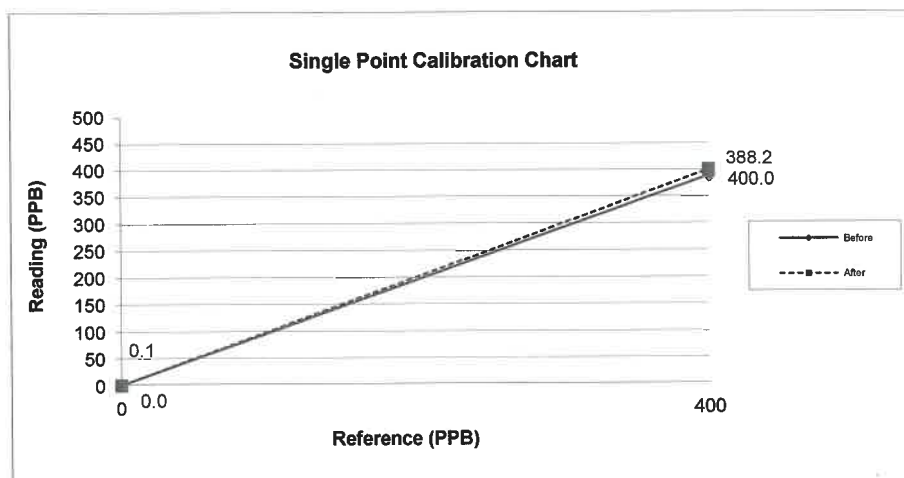
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	388.2	-3.0
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

R.Thongchai
Mr.Thongchai khaisuban





Analyzer Performance Test

Calibrated Date: October 11, 2024

Instruments Information

Analyzer Type: SO2 Analyzer Model: 100	Manufacturer API S/N: 368
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Calibration System

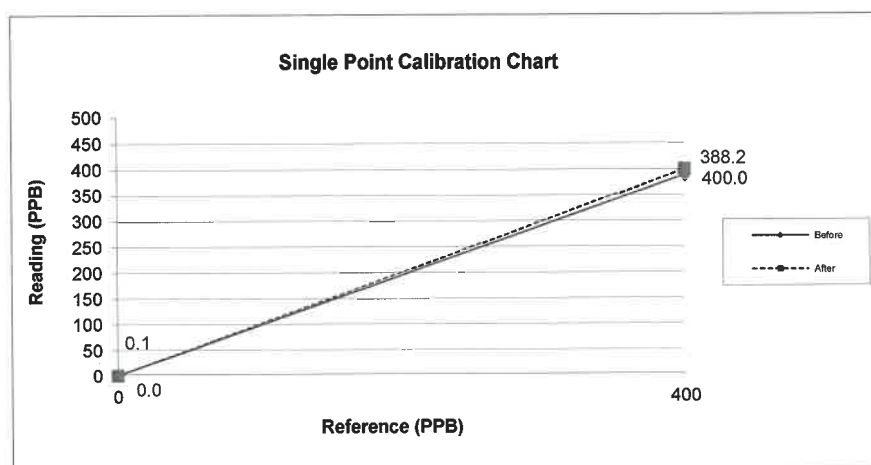
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	388.2	-3.0
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

K.Thongchai
Mr.Thongchai Khlaisuban





Analyzer Performance Test

Calibrated Date: October 11, 2024

Instruments Information

Analyzer Type: SO2 Analyzer Model: 100	Manufacturer API S/N: 194
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Calibration System

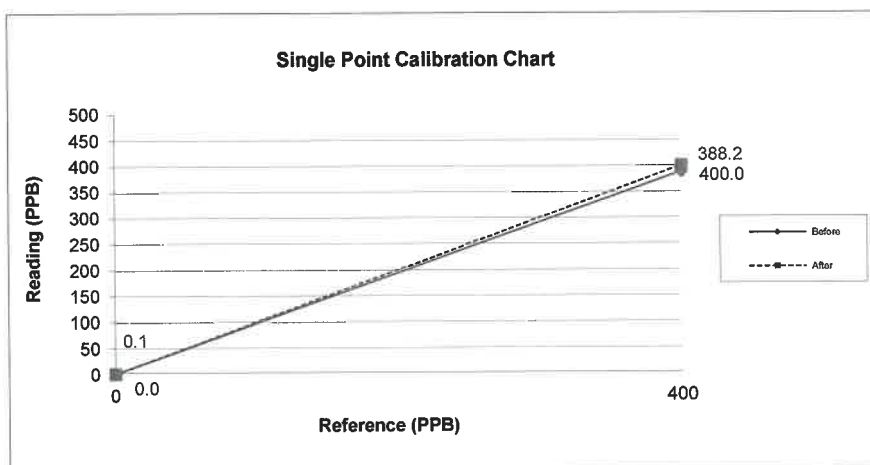
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	388.2	-3.0
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

K. Thongchai
Mr.Thongchai Khaisuban





Analyzer Performance Test

Calibrated Date: October 11, 2024

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: 200A	Manufacturer API S/N: 1439
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Calibration System

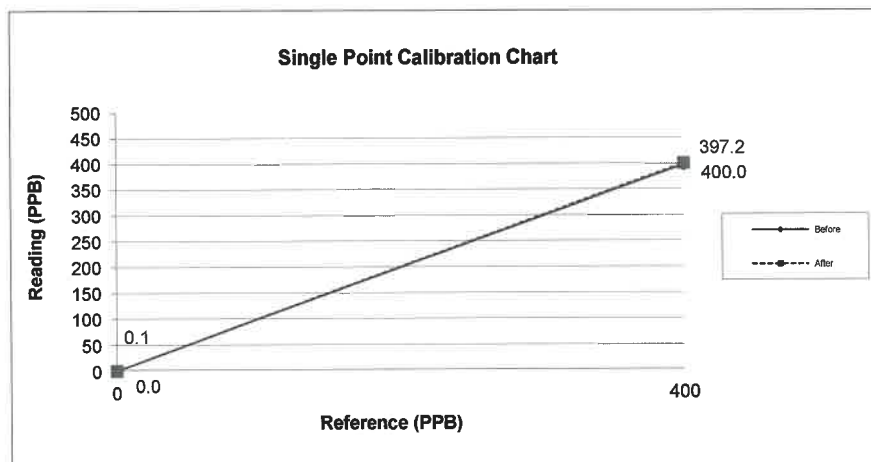
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO ₂ Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	397.2	-0.7
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

K-Thongchai
Mr.Thongchai Khlaisuban





Analyzer Performance Test

Calibrated Date: October 11, 2024

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: EC 9841 Series Nox	Manufacturer ECOTECH S/N: 06-1021
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Calibration System

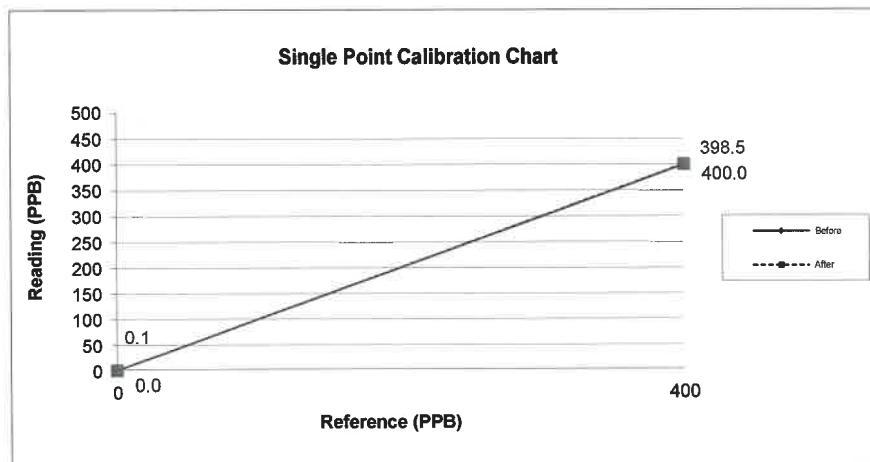
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	398.5	-0.4
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

K-Thongchai
Mr.Thongchai khlaisuban





Analyzer Performance Test

Calibrated Date: October 11, 2024

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: Electron Corporation	Manufacturer API S/N: 249
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Calibration System

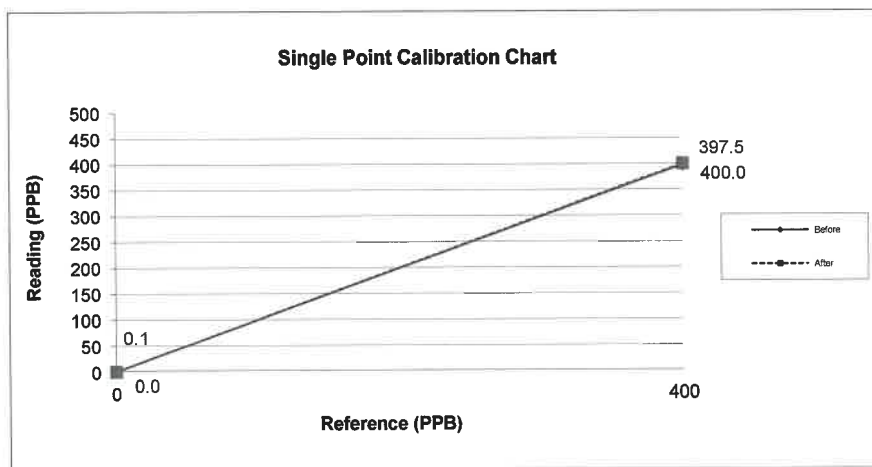
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO ₂ Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	397.5	-0.6
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

K.Thongchai
Mr.Thongchai khaisuban





Analyzer Performance Test

Calibrated Date: October 11, 2024

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: Electron Corporation	Manufacturer Thermo S/N: 426408775
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Calibration System

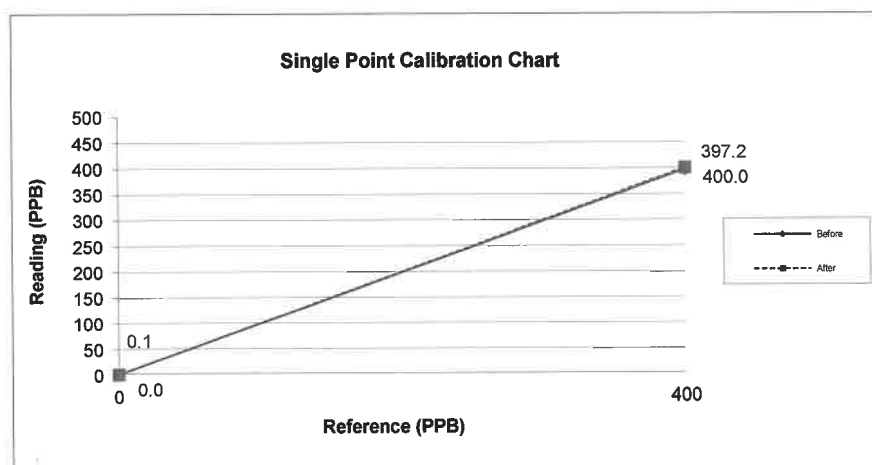
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO ₂ Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPB)	Reading (PPB)	Drift (PPB)	Reference (PPB)	Reading (PPB)	Drift%
Before	0.0	0.1	0.1	400.0	397.2	-0.7
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

R.Thongchai
Mr.Thongchai khaisuban





บริษัท สแตค คอนซัลติ้ง จำกัด
Stack Consulting Co.,Ltd.

บริษัท สแตค คอนซัลติ้ง จำกัด
14/3504-3505 หมู่ 14 ตำบลบางบัวทอง อำเภอบางบัวทอง
จังหวัดนนทบุรี 11110 โทร. 02-922-6573

Analyzer Performance Test

Calibrated Date: October 11, 2024

Instruments Information

Analyzer Type: CO Analyzer Model: EC 9830 Series CO	Manufacturer ECOTECH S/N: 04-1081
--	--------------------------------------

Calibration System

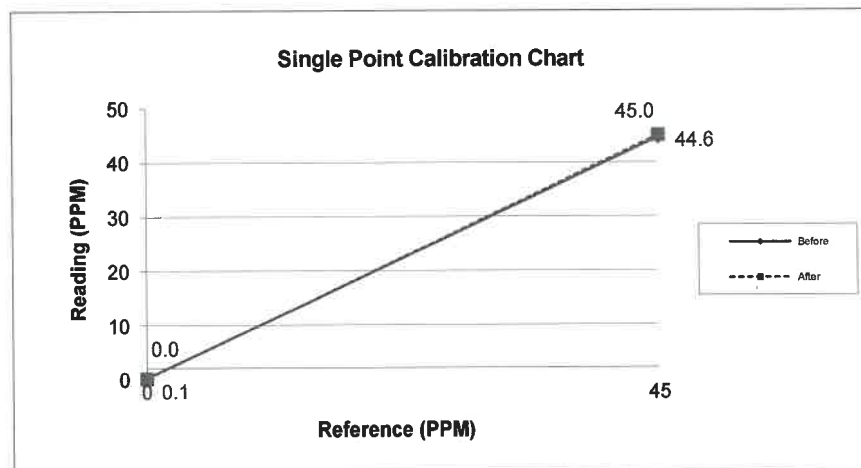
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.6	-0.9
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By :

K.Thongchai
Mr.Thongchai khlaisuban





บริษัท สแตค คอนซัลติ้ง จำกัด
Stack Consulting Co.,Ltd.

บริษัท สแตค คอนซัลติ้ง จำกัด
14/3504-3505 หมู่ 14 ตำบลบางบัวทอง อำเภอบางบัวทอง
จังหวัดนนทบุรี 11110 โทร. 02-922-6573

Analyzer Performance Test

Calibrated Date: October 11, 2024

Instruments Information

Analyzer Type: CO Analyzer Model: 300	Manufacturer API S/N: 424
--	------------------------------

Calibration System

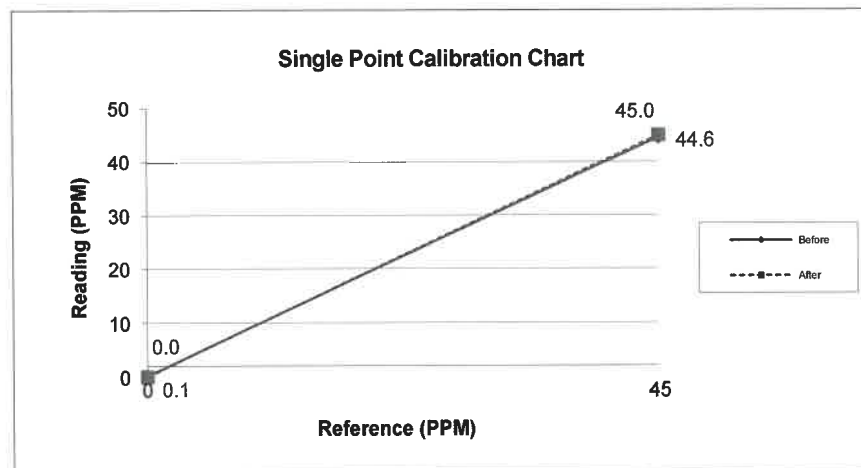
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.6	-0.9
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By :

K. Thongchai
Mr.Thongchai khlaisuban





บริษัท สแตค คอนซัลติ้ง จำกัด
Stack Consulting Co.,Ltd.

บริษัท สแตค คอนซัลติ้ง จำกัด
14/3504-3505 หมู่ 14 ตำบลบางบัวทอง อำเภอบางบัวทอง
จังหวัดนนทบุรี 11110 โทร. 02-922-6573

Analyzer Performance Test

Calibrated Date: October 11, 2024

Instruments Information

Analyzer Type: CO Analyzer Model: 300	Manufacturer API S/N: 447
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Calibration System

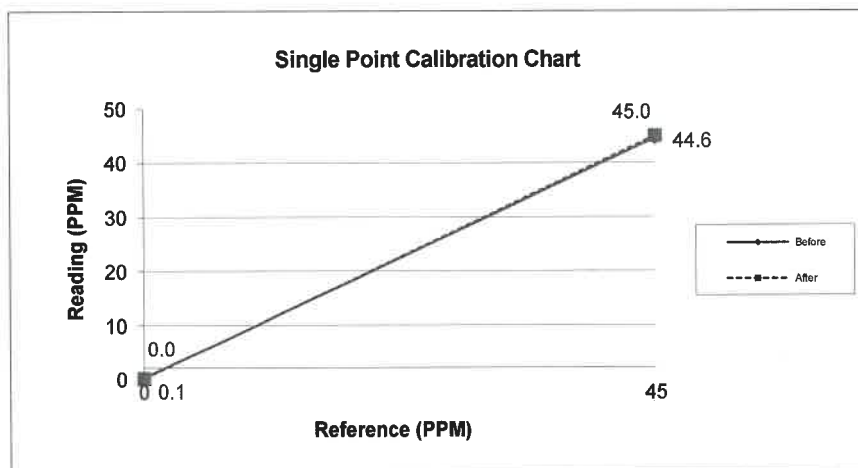
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO ₂ Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.6	-0.9
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By :

Mr.Thongchai khaisuban

K.Thongchai





บริษัท สแตค คอนซัลติ้ง จำกัด
Stack Consulting Co.,Ltd.

บริษัท สแตค คอนซัลติ้ง จำกัด
14/3504-3505 หมู่ 14 ตำบลบางบัวทอง อำเภอบางบัวทอง
จังหวัดนนทบุรี 11110 โทร. 02-922-6573

Analyzer Performance Test

Calibrated Date: October 11, 2024

Instruments Information

Analyzer Type: CO Analyzer Model: 300	Manufacturer API S/N: 411
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Calibration System

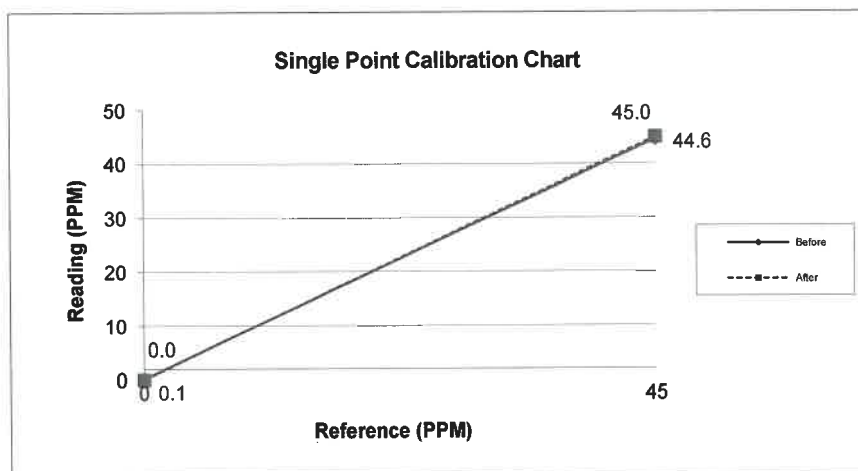
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 55.47 PPM SO2 Conc 55.11 PPM CO Conc 4,535 PPM Cylinder number EB0129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.6	-0.9
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By :

K. Thongchai
Mr.Thongchai khlaisuban





Certificate of Calibration

Certificate Number : SPR25010338-2

Page : 1 of 3

Customer : Gold Environment Co.,Ltd.

64/144 Moo.1 T.Bangkrang, A.Muang, Nonthaburi 11000

Equipment Name : Primary Flow Meter

Manufacturer : DryCal

Model : DCL-M

Serial Number : 108326

ID. Number : N/A

Environmental Conditions

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

Received Date : 21 Jan 2025

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

Calibration Date : 25 Jan 2025

Location of Calibration : In-Lab

Recommend Due Date : 25 Jan 2026

Calibration Procedure : SP-CPM-04-13

Date of Issue : 26 Jan 2025

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.Jirasak Pumbut

Calibration Officer

Approved by :

(Mr.Prayoon Topart)

Authorized Signatory



Calibration Report

Certificate Number : SPR25010338-2

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Standard Flow Meter	520-H	200353	LO-2507005/24	27 Jul 2025

Traceability

This certification is traceable to the International System of Unit maintained at :
THC - Thai Heart Calibration Co.,Ltd.



Result of Calibration

Certificate Number : SPR25010338-2

Page : 3 of 3

Range : 0.01 to 12 L/Min Resolution : 0.0001 L/Min Accuracy \pm : 2 % of Reading

Function : Air Flow Measurement

Unit : L/Min

Calibration Point	UUC Reading	Standard Reading	UUC Error	K Factor Value	Uncertainty (\pm)
0.2	0.2005	0.2012	-0.0007	1.003491	0.0065
0.5	0.5020	0.5032	-0.0012	1.002390	0.012
1.0	0.999	1.007	-0.008	1.008008	0.012
2.0	2.006	2.010	-0.004	1.001994	0.021
3.0	3.009	3.015	-0.006	1.001994	0.031
4.0	4.013	4.022	-0.009	1.002243	0.040

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 -



Professional Calibration & Services Co., Ltd.

50/888, 50/889 Moo 2, Rungsit-Nakornnayok Rd., Bungeeetho, Thunyaburi,
Pathumthani 12130 Thailand
Tel : (+66)2150-6641 (Autoline), (+66)2569-5158
Email : info@p-cal.com www.p-cal.com



Certificate of Calibration

Page 1 of 3

Certificate Number : PL12662/24
Control Number : PCAL161552
Customer Control : -
Description : Vibration Meter
Manufacturer : Micromate
Model : 721A2901
Serial Number : UM13537
Customer : Stack Consulting Co.,Ltd.
14/3504-3505 Moo 14, T. Bang Bua Thong,
A. Bang Bua Thong, Nonthaburi 11110



Date of Receipt : 07-Mar-24
Date of Calibration : 11-Mar-24
Environment : Temperature $20^{\circ}\text{C} \pm 2^{\circ}\text{C}$
: Relative Humidity $50\% \pm 20\%$
Calibration Method : Calibration Procedure Number CP-PL22
Calibration Results : See data attached

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

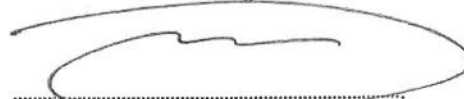
This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

Calibrated By

Ms. Supattra Mungkasam

Authorized Signature


(Mr. Songpol Nakanurak)

13-Mar-24

Issued Date

CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : PL12662/24

Page 2 of 3

Equipment Standards Used

Description	Serial No.	Traceability to	Certificate No.	Cal. Due Date
Vibration Calibrator	507221	ANAB : AC-2658	ENU300908	21-Oct-24

Condition as received : Normal

Definitions :-

* ANAB - The ANSI National Accreditation Board

CALIBRATION REPORT

Professional Calibration & Services Co., Ltd.

Certificate No.: PL12662/24

Page : 3 of 3

Calibration Results

Appearance and function of use : Good

Results of Calibration : ☒ Without adjustment

☐ With adjustment

Details of Equipment : Velocity @ 160 Hz (rms)

Resolution: 0.001mm/s

Standard Value (mm/s)	UUC Reading (mm/s)	UUC Error (mm/s)	Uncertainty (± mm/s)
0.3	0.306	0.006	0.066
0.5	0.511	0.011	0.066
1	1.026	0.026	0.066
10	10.042	0.042	0.24
20	20.059	0.059	0.44
30	30.074	0.074	0.63
40	40.082	0.082	0.84
50	50.108	0.108	1.1

...End...

Pass
13/3/16



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

81 Moo 11 Bangkruai - Sainoi Rd., Sainoi, Nonthaburi 11150 Tel. (662) 436-8789 Ext. 6155



Certificate of Calibration

Issued by : Vibration Laboratory

Certificate No. : 25V0030

Reference No. : CBLUE01V013

Received Date : 14 March 2025

Calibrated Date : 17 March 2025

Page 1 of 3

Client : Blue Consultant Limited Partnership

Address : 32/751 Pracha - Uthit Rd., Thung Khru, Bangkok 10140

Equipment : VIBRATION METER

Manufacture /Brand : INSTANTEL

Model : Micromate

Serial No./ ID No. : UM21456



(Mr. Bamrung Saengthien)

Authorized Signatory

Issue Date 18, March 2025

This certificate is issued in accordance with the conditions of accreditation granted by The National Accreditation Council of Thailand which has assessed the measurement capability of the laboratory and its traceability to recognised national standards and to the units of measurement realised at the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration services and environmental analysis department. This reported measurement result relates only the measurand and applies only at the time of measurement.



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate No. 25V0030

Page 2 of 5

Reference Standard Used

Description	Manufacture/Model	Serial No.	Traceable No.	Due Date
Accelerometer Type 8305	Brue! & Kjaer	1262817	AV-0014-23	28 March 2025
Conditioning Amplifier Type 2635	Brue! & Kjaer	2371579	AV-0013-23	27 March 2025
Digital Multimeter /8846A	FLUKE	4330020	24E513	22 September 2025

Traceability

This certificate provides traceability of measurement to the International System of Units (SI) through

- National Institute of Metrology (Thailand) (NIMT)
- Metrology and Calibration Department (EGAT)

Environmental Conditions

The calibration was performed in an environment of $(23\pm 2)^{\circ}\text{C}$ and $(50\pm 10)\%\text{RH}$

Measurement Method

The unit under calibration was calibrated by comparison with standard accelerometer. The calibration method is based on ISO 16063-21 : 2003(E) by comparison with reference accelerometer standard .

Uncertainty of Measurement

The measurement uncertainty are labeled on the following pages completed the expanded uncertainty that calculated in accordance with the method to describe in M3003, using coverage factor $k=2$, The value of the measured lies within the assigned ranges the measured lies within the assigned ranges of values to a coverage probability of approximately 95%.

Tabulation of Results

The measurement results, labeled in the following pages give the calibration results and associated measurement uncertainties.



Metrology and Calibration Department
Electrical Maintenance Division
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate No. 25V0030

Page 3 of 3

Measurement Results

DESCRIPTION Frequency (Hz)	STD Applied Value (mm/s _p)	UUC Reading (mm/s _p)	Uncertainty (± mm/s _p)	Direction
*20	10.00	10.14	0.15	Vertical (V)
*30	10.00	10.20	0.15	
40	10.00	10.19	0.15	
80	10.00	10.09	0.15	
*20	10.00	10.16	0.15	Transverse (T)
*30	10.00	10.16	0.15	
40	10.00	10.14	0.15	
80	10.00	10.00	0.15	
*20	10.00	10.22	0.15	Longitudinal (L)
*30	10.00	10.26	0.15	
40	10.00	10.25	0.15	
80	10.00	10.19	0.15	

Note

Tranducer Part : 721A3301

Serial No. : UM21456

Remark: * Measurement results outside the scope of accreditation.



Professional Calibration & Services Co., Ltd.

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Pathumthani 12130 Thailand
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Email : info@p-cal.com www.p-cal.com



Certificate of Calibration

Certificate Number : EL11936/25
Control Number : PCAL183778
Customer Control : -
Description : Sound Level Meter
Manufacturer : SCARLET/TECH
Model : ST 21D
Serial Number : 820775
Customer : บริษัท จัตุรัส เอ็นไวรอนเม้นท์ จำกัด

Page 1 of 3



34/76 ซอยประชาอุทิศ 33 แขวงบางมด เขตทุ่งครุ
กรุงเทพมหานคร 10140

Date of Receipt : 03-Mar-25
Date of Calibration : 03-Mar-25
Environment : Temperature $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$
: Relative Humidity $50\% \pm 20\%$
Calibration Method : Calibration Procedure Number CP-EL35
Calibration Results : See data attached

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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

Calibrated By

Mr. Watcharapol Horasit

Authorized Signature

(Mr. Manote Piwnimnual)

07-Mar-25

Issued Date

CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : EL11936/25

Page 2 of 3

Equipment Standards Used

Description	Serial No.	Traceability to	Certificate No.	Cal. Due Date
Sound Calibrator	125626778	NSC : Calibration 0037	EEL.BP. 99/0168	23-Jan-26

Condition as received : Normal

Definitions :-

* NSC - National Standardization Council of Thailand

CALIBRATION REPORT

Professional Calibration & Services Co., Ltd.

Certificate No.: EL11936/25

Page : 3 of 3

Calibration Results

Sound Level Measurement Accuracy

Frequency Weighting: A-Weighting

UUC Range	Standard Value	UUC Reading	Uncertainty (±)	Tolerance Limit Value
28 to 133 dB	94 dB	94.4 dB	0.17 dB	93.3 ~ 94.7 dB
	114 dB	114.1 dB	0.17 dB	113.3 ~ 114.7 dB

Frequency Weighting: C-Weighting

UUC Range	Standard Value	UUC Reading	Uncertainty (±)	Tolerance Limit Value
28 to 133 dB	94 dB	94.5 dB	0.17 dB	93.3 ~ 94.7 dB
	114 dB	114.0 dB	0.17 dB	113.3 ~ 114.7 dB

Frequency Weighting: Z-Weighting

UUC Range	Standard Value	UUC Reading	Uncertainty (±)	Tolerance Limit Value
28 to 133 dB	94 dB	94.5 dB	0.17 dB	93.3 ~ 94.7 dB
	114 dB	114.1 dB	0.17 dB	113.3 ~ 114.7 dB

Notes:

- 1). Tolerances or specifications report in table above are based on IEC 61672-1:2013 Class 2 Standard,.

...End...



SMART TECH CALIBRATION & SERVICES CO., LTD.

14/506 MOO 3, RANGSIT-NAKHON NAYOK ROAD, LAM PHAK KUT,
THANYABURI, PATHUM THANI 12110, THAILAND

Tel. +662-114-3148 Email : stcal.md@gmail.com Website : stc-cal.com



Certificate of Calibration

Certificate No. STCR-2502128-17

Work Order No. STCR-2502128

Page 1 of 3

Customer Name : Stack Consulting Co., Ltd.
14/3504-3505 Moo. 14, Soi Pailin, T. Bang Bua Thong,
A. Bang Bua Thong, Nonthaburi 11110

Equipment Name : Sound Level Meter
Manufacturer : Rion
Model : NL-21
Serial Number : 00843641
Control Number : Stack#N-09
Received Date : Feb 28, 2025
Calibration Date : Mar 1, 2025
Recommended Due Date : Mar 1, 2026
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

Ambient Temperature : $(25 \pm 2) ^\circ\text{C}$
Ambient Relative Humidity : $(50 \pm 15) \% \text{RH}$
Calibration Place : Permanent Calibration Laboratory

Condition as received : Normal

Calibration Result : See data attached

1. 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%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co., Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Mar 5, 2025

Calibrated by : C. Jirayu

Approved by :



@smarttechcal

Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: SPCR-2502128-17

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975185	5523631031354566	Nov 6, 2025	MP-TH

Traceability

This calibration is traceable to the International System of Unit via :

- MP-TH : Micro Precision Calibration Laboratory (Thailand) Co., Ltd.



Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2502128-17

Page 3 of 3

UUC Range : (30 to 130) dB

Resolution : 0.1 dB

Results of Calibration: [] Without adjustment [☒] With adjustment

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB	93.4 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.1 dB	113.8 dB	0.27 dB	0.40 dB
SLOW	94.09 dB	93.4 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.1 dB	113.8 dB	0.27 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB	93.5 dB	94.1 dB	-0.01 dB	0.40 dB
	114.07 dB	113.2 dB	113.8 dB	0.27 dB	0.40 dB
SLOW	94.09 dB	93.5 dB	94.1 dB	-0.01 dB	0.40 dB
	114.07 dB	113.2 dB	113.8 dB	0.27 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



**SMART TECH CALIBRATION & SERVICES CO., LTD.**

14/506 MOO 3, RANGSIT-NAKHON NAYOK ROAD, LAM PHAK KUT,
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Certificate of Calibration

Certificate No. STCR-2502128-18

Work Order No. STCR-2502128

Page 1 of 3

Customer Name : Stack Consulting Co., Ltd.
14/3504-3505 Moo. 14, Soi Pailin, T. Bang Bua Thong,
A. Bang Bua Thong, Nonthaburi 11110

Equipment Name : Sound Level Meter
Manufacturer : Rion
Model : NL-21
Serial Number : 00798602
Control Number : Stack#N-11
Received Date : Feb 28, 2025
Calibration Date : Mar 1, 2025
Recommended Due Date : Mar 1, 2026
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

Ambient Temperature : $(25 \pm 2) ^\circ\text{C}$
Ambient Relative Humidity : $(50 \pm 15) \% \text{RH}$
Calibration Place : Permanent Calibration Laboratory

Condition as received : Normal

Calibration Result : See data attached

1. 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%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co., Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Mar 5, 2025

Calibrated by : C. Jirayu

Approved by :

(Mr Chayut Wongleang)
Laboratory Manager



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Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2502128-18

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975185	5523631031354566	Nov 6, 2025	MP-TH

Traceability

This calibration is traceable to the International System of Unit via :

- MP-TH : Micro Precision Calibration Laboratory (Thailand) Co., Ltd.



Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2502128-18

Page 3 of 3

UUC Range : (30 to 130) dB

Resolution : 0.1 dB

Results of Calibration: [] Without adjustment [☒] With adjustment

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB	93.3 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.0 dB	113.9 dB	0.17 dB	0.40 dB
SLOW	94.09 dB	93.3 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.0 dB	113.9 dB	0.17 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB	93.3 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.1 dB	113.8 dB	0.27 dB	0.40 dB
SLOW	94.09 dB	93.3 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.1 dB	113.8 dB	0.27 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



**SMART TECH CALIBRATION & SERVICES CO., LTD.**

14/506 MOO 3, RANGSIT-NAKHON NAYOK ROAD, LAM PHAK KUT,
THANYABURI, PATHUM THANI 12110, THAILAND

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**Certificate of Calibration**

Certificate No. STCR-2502128-19

Work Order No. STCR-2502128

Page 1 of 3

Customer Name : Stack Consulting Co., Ltd.
14/3504-3505 Moo. 14, Soi Pailin, T. Bang Bua Thong,
A. Bang Bua Thong, Nonthaburi 11110

Equipment Name : Sound Level Meter
Manufacturer : Rion
Model : NL-21
Serial Number : 00954622
Control Number : Stack#N-12
Received Date : Feb 28, 2025
Calibration Date : Mar 1, 2025
Recommended Due Date : Mar 1, 2026
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

Ambient Temperature : $(25 \pm 2) ^\circ\text{C}$
Ambient Relative Humidity : $(50 \pm 15) \% \text{RH}$
Calibration Place : Permanent Calibration Laboratory

Condition as received : Normal

Calibration Result : See data attached

1. 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%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co., Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Mar 5, 2025

Approved by :

Calibrated by : C. Jirayu



(Mr.Chayut Wongleang)
Laboratory Manager



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Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: SPCR-2502128-19

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975185	5523631031354566	Nov 6, 2025	MP-TH

Traceability

This calibration is traceable to the International System of Unit via :

- MP-TH : Micro Precision Calibration Laboratory (Thailand) Co., Ltd.



Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2502128-19

Page 3 of 3

UUC Range : (30 to 130) dB

Resolution : 0.1 dB

Results of Calibration: [] Without adjustment [☒] With adjustment

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB	93.5 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.3 dB	113.8 dB	0.27 dB	0.40 dB
SLOW	94.09 dB	93.5 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.2 dB	113.8 dB	0.27 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB	13.6 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.3 dB	113.8 dB	0.27 dB	0.40 dB
SLOW	94.09 dB	13.6 dB	94.0 dB	0.09 dB	0.40 dB
	114.07 dB	113.3 dB	113.8 dB	0.27 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -

