

ภาคผนวก 3ค

เอกสารการสอบเทียบเครื่องมือตรวจวัด

บริษัท เอ็นไวรอนเมนต์ รีเสิร์ช แอนด์
เทคโนโลยี จำกัด

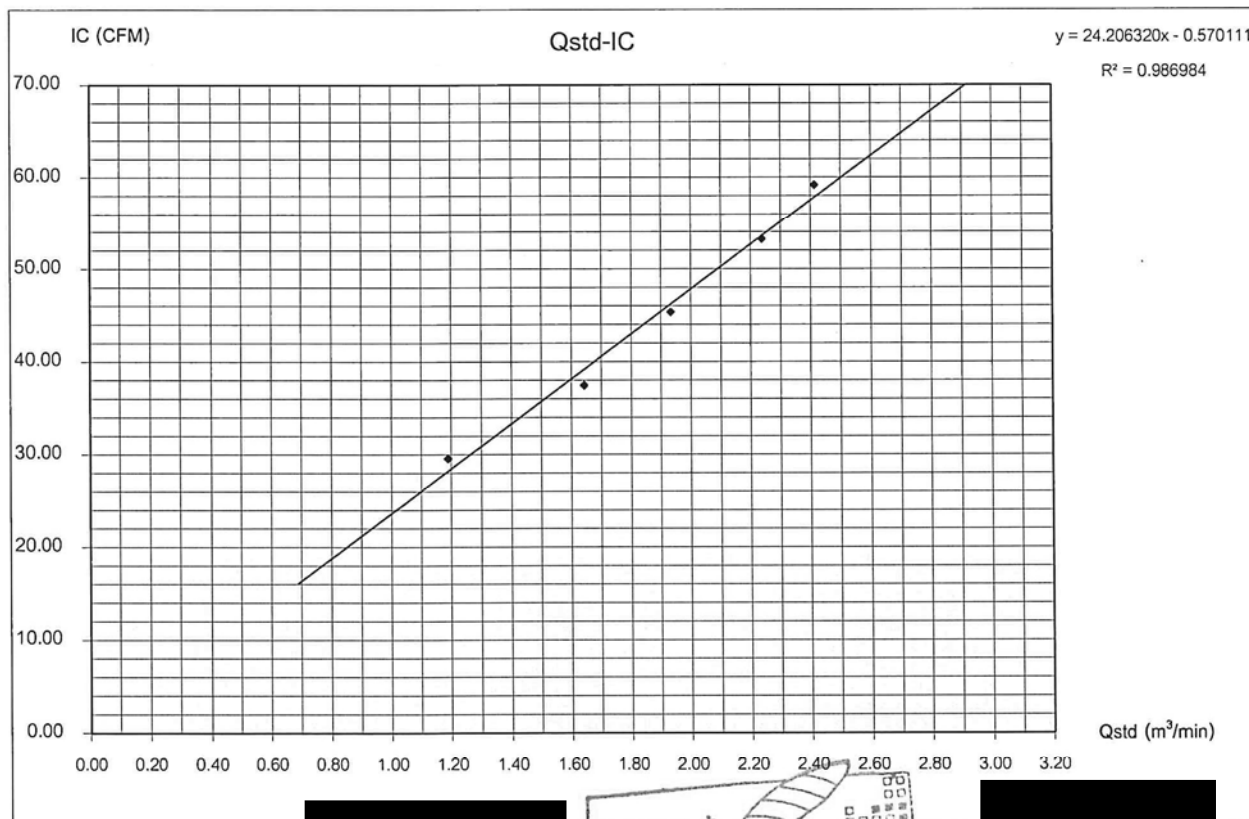
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	June 17, 2023
ท่าเทียบเรือโชคชัย (2023-00883)				Start Time	2:15 PM
Sampler Number	PM-10 No.12	Transfer Standard Type	Orifice	Stop Time	2:25 PM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Akarawit Boonsong
Motor Serial Number	B2012-10	Calibrator Serial Number	2716		
Recorder Serial Number	4650				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter	
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$	ample Flow Rate Indicato	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$					
	Positive	Negative	ΔH_2O		(m ³ /min)	(ft ³ /min)		(°K = °C+273)	(mmHg)			
5	1.2	1.2	2.4	1.52829	1.18825	30.0	29.60	305.0	757.0			
7	2.3	2.3	4.6	2.11582	1.64000	38.0	37.49	305.0	757.0			
10	3.2	3.2	6.4	2.49568	1.93207	46.0	45.38	305.0	757.0			
13	4.3	4.3	8.6	2.89300	2.23756	54.0	53.27	305.0	757.0			
18	5.0	5.0	10.0	3.11960	2.41180	60.0	59.19	305.0	757.0			
Linear Regression Y ON X : Y= mX + b							Average	305.0	757.0			
1	Slope (m)			1.30058	Linear Equation			r ²	0.986984	Pstd(mmHg)	760.0	
2	Intercept (b)			-0.01713	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9934707	T _{NTP}	298.0	
3	Correlation Coefficient (r)			0.99953	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.973192407		
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.986505148	

COMMENT

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Environmental Scientist

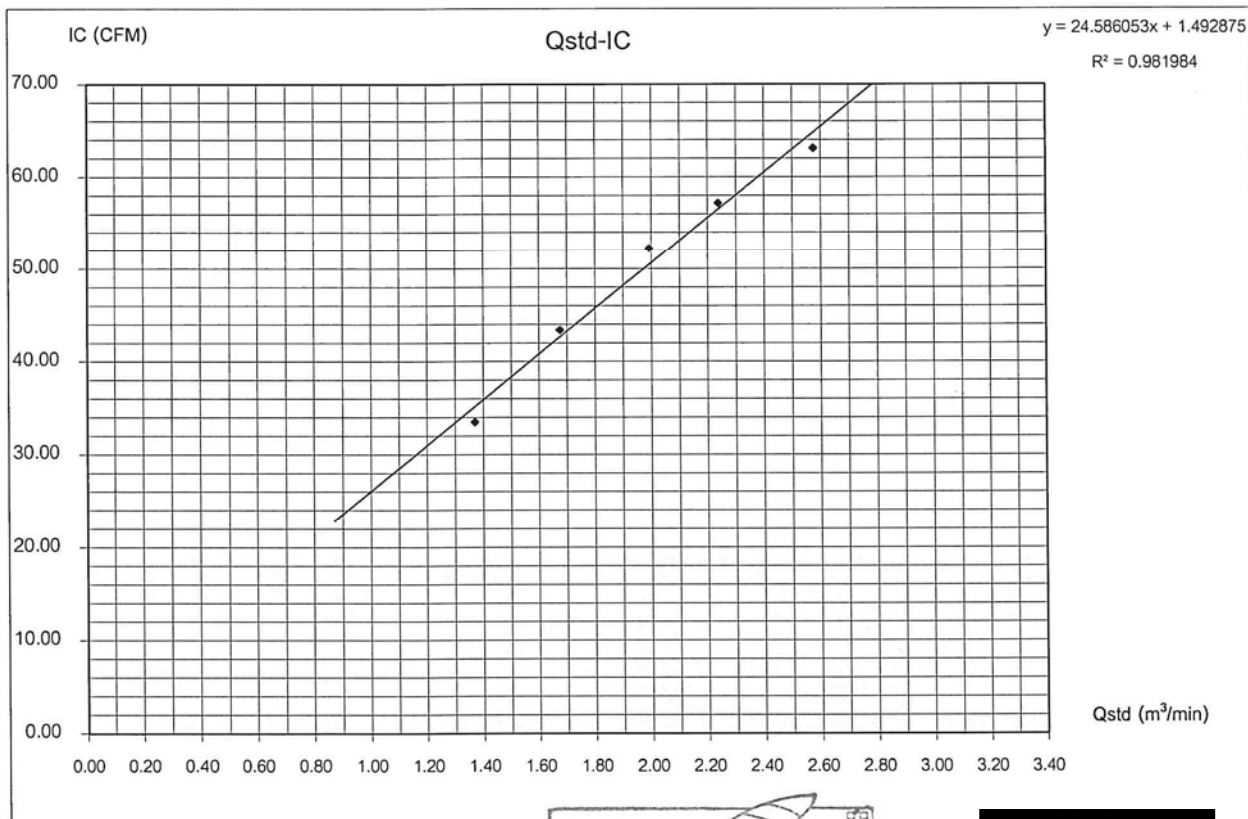
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	June 17, 2023
ท่าเทียบเรือโชคชัย (2023-00883)				Start Time	2:05 PM
Sampler Number	TSP No.A18	Transfer Standard Type	Orifice	Stop Time	2:15 PM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Aakarawit Boonsong
Motor Serial Number	2014-03	Calibrator Serial Number	2716		
Recorder Serial Number	7373				

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)	Sample 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	1.6	3.2	1.76471	1.37004	34.0	33.54	305.0	757.0			
7	2.4	2.4	4.8	2.16132	1.67499	44.0	43.41	305.0	757.0			
10	3.4	3.4	6.8	2.57249	1.99113	53.0	52.28	305.0	757.0			
13	4.3	4.3	8.6	2.89300	2.23756	58.0	57.22	305.0	757.0			
18	5.7	5.7	11.4	3.33082	2.57420	64.0	63.14	305.0	757.0			
Linear Regression Y ON X : Y= mX + b							Average	305.0	757.0			
1	Slope (m)			1.30058	Linear Equation			r ²	0.981984	Pstd(mmHg)	760.0	
2	Intercept (b)			-0.01713	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9909511	T _{NTP}	298.0	
3	Correlation Coefficient (r)			0.99953	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.973192407		
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.986505148	

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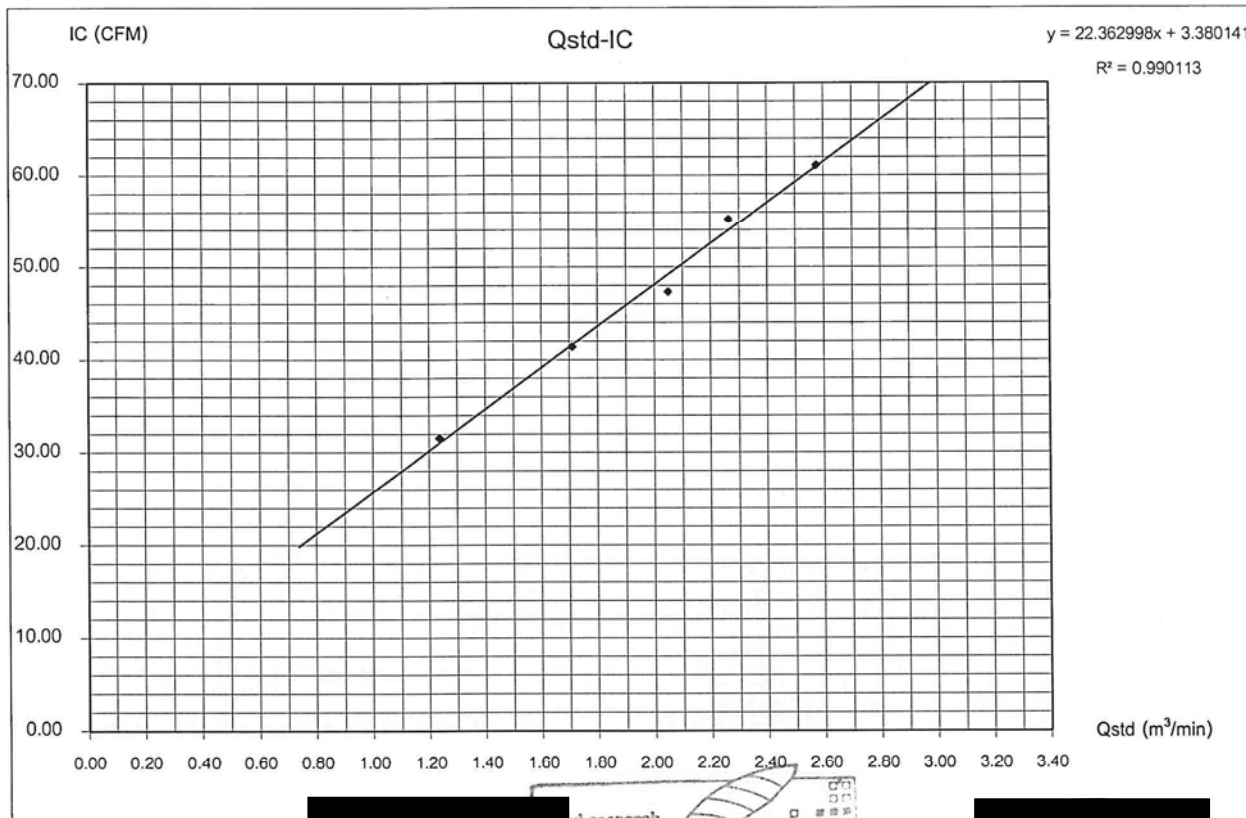
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	June 17, 2023
สนง.ภายในโครงการ (2023-00883)				Start Time	2:42 PM
Sampler Number	PM-10 No.13	Transfer Standard Type	Orifice	Stop Time	2:52 PM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Akarawit Boonsong
Motor Serial Number	A9	Calibrator Serial Number	2716		
Recorder Serial Number	4654				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	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)	(mmHg)		
	Positive	Negative	ΔH ₂ O								
5	1.3	1.3	2.6	1.59069	1.23623	32.0	31.57	305.0	757.0		
7	2.5	2.5	5.0	2.20589	1.70925	42.0	41.43	305.0	757.0		
10	3.6	3.6	7.2	2.64707	2.04847	48.0	47.35	305.0	757.0		
13	4.4	4.4	8.8	2.92645	2.26328	56.0	55.24	305.0	757.0		
18	5.7	5.7	11.4	3.33082	2.57420	62.0	61.16	305.0	757.0		
Linear Regression Y ON X : Y= mX + b							Average	305.0	757.0		
1	Slope (m)			1.30058	Linear Equation			r ²	0.990113	Pstd(mmHg)	760.0
2	Intercept (b)			-0.01713	Set Point Flow Rate (X) (m ³ /min)	1.133		r	0.9950442	T _{NTP}	298.15
3	Correlation Coefficient (r)			0.99953	Final Set Flow Rate = (I)	0		(Pa/Pstd)*(Tstd/Ta)			0.973192407
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.986505148

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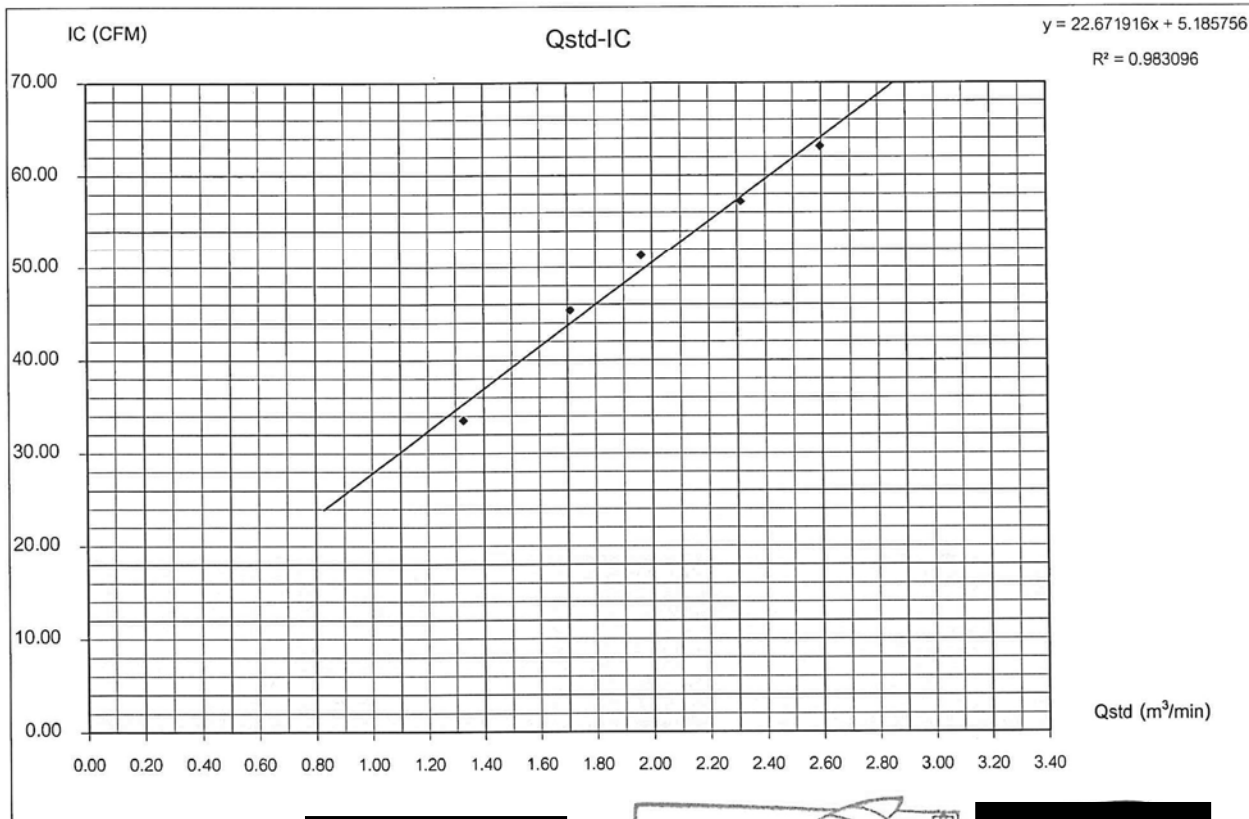
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	June 17, 2023
สนง.ภายในโครงการ (2023-00883)				Start Time	2:31 PM
Sampler Number	TSP No.A19	Transfer Standard Type	Orifice	Stop Time	2:41 PM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Aakarawit Boonsong
Motor Serial Number	2014-04	Calibrator Serial Number	2716		
Recorder Serial Number	7372				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	Pressure Drop Across Orifice (inH ₂ O)			$[\Delta H_2O(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	$Q_{std} = \{1/m\}[(A-b)]$	Sample Flow Rate Indication	$IC = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	(*K = °C+273)	(mmHg)		
	Positive	Negative	ΔH_2O		(m ³ /min)	(ft ³ /min)					
5	1.5	1.5	3.0	1.70868	1.32695	34.0	33.54	305.0	757.0		
7	2.5	2.5	5.0	2.20589	1.70925	46.0	45.38	305.0	757.0		
10	3.3	3.3	6.6	2.53438	1.96182	52.0	51.30	305.0	757.0		
13	4.6	4.6	9.2	2.99222	2.31385	58.0	57.22	305.0	757.0		
18	5.8	5.8	11.6	3.35992	2.59657	64.0	63.14	305.0	757.0		
Linear Regression Y ON X : Y= mX + b							Average	305.0	757.0		
1	Slope (m)			1.30058	Linear Equation			r ²	0.983096	Pstd(mmHg)	760.0
2	Intercept (b)			-0.01713	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.991512	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99953	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.973192407	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.986505148	

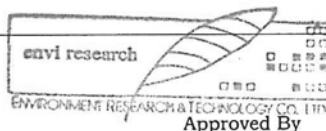
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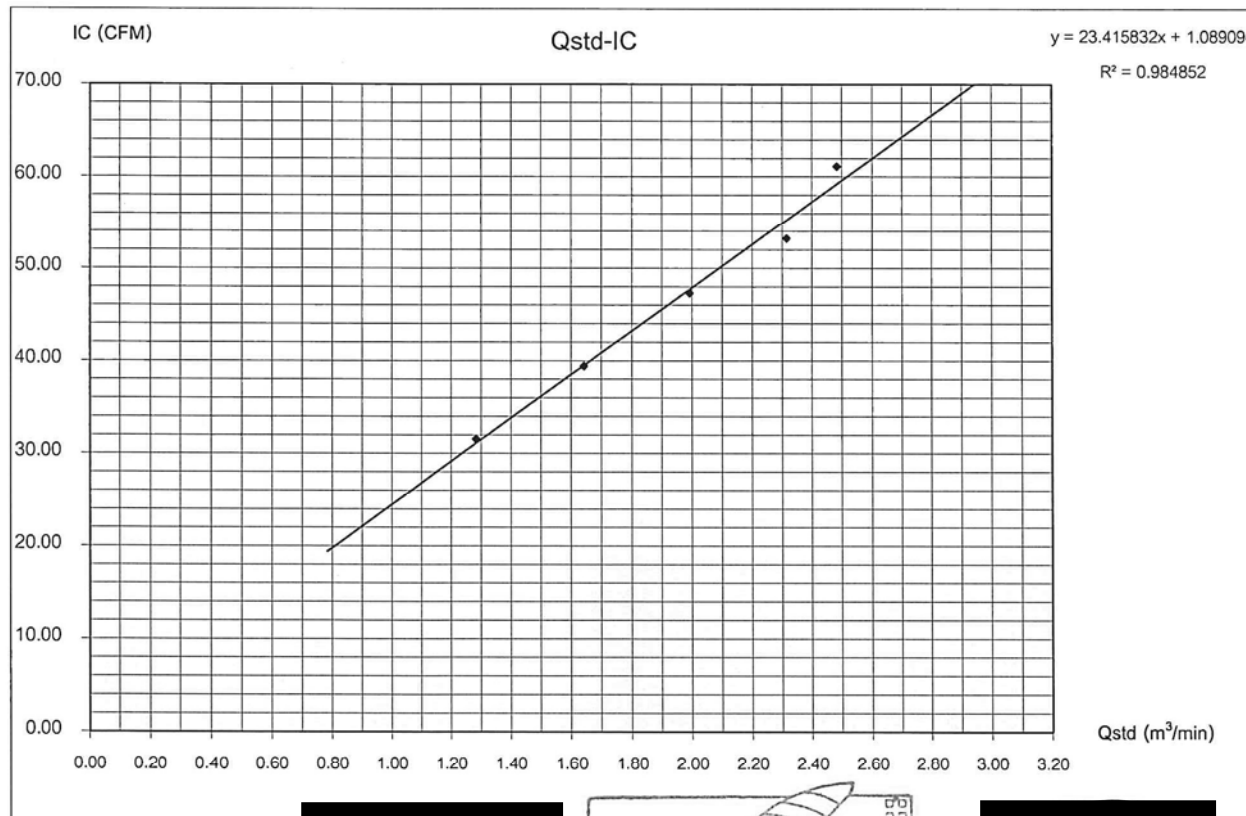
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	June 16, 2023
ชุมชนบ้านผอ (2023-00883)				Start Time	4:10 PM
Sampler Number	PM-10 No.21	Transfer Standard Type	Orifice	Stop Time	4:20 PM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Akarawit Boonsong
Motor Serial Number	2132	Calibrator Serial Number	2716		
Recorder Serial Number	2392				

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	1.4	1.4	2.8	1.65074	1.28240	32.0	31.57	305.0	757.0			
7	2.3	2.3	4.6	2.11582	1.64000	40.0	39.46	305.0	757.0			
10	3.4	3.4	6.8	2.57249	1.99113	48.0	47.35	305.0	757.0			
13	4.6	4.6	9.2	2.99222	2.31385	54.0	53.27	305.0	757.0			
18	5.3	5.3	10.6	3.21183	2.48271	62.0	61.16	305.0	757.0			
Linear Regression Y ON X : Y= mX + b							Average	305.0	757.0			
1	Slope (m)			1.30058	Linear Equation			r ²	0.984852	Pstd(mmHg)	760.	
2	Intercept (b)			-0.01713	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9923971	T _{NTP}	298.	
3	Correlation Coefficient (r)			0.99953	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.973192407	
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.986505148

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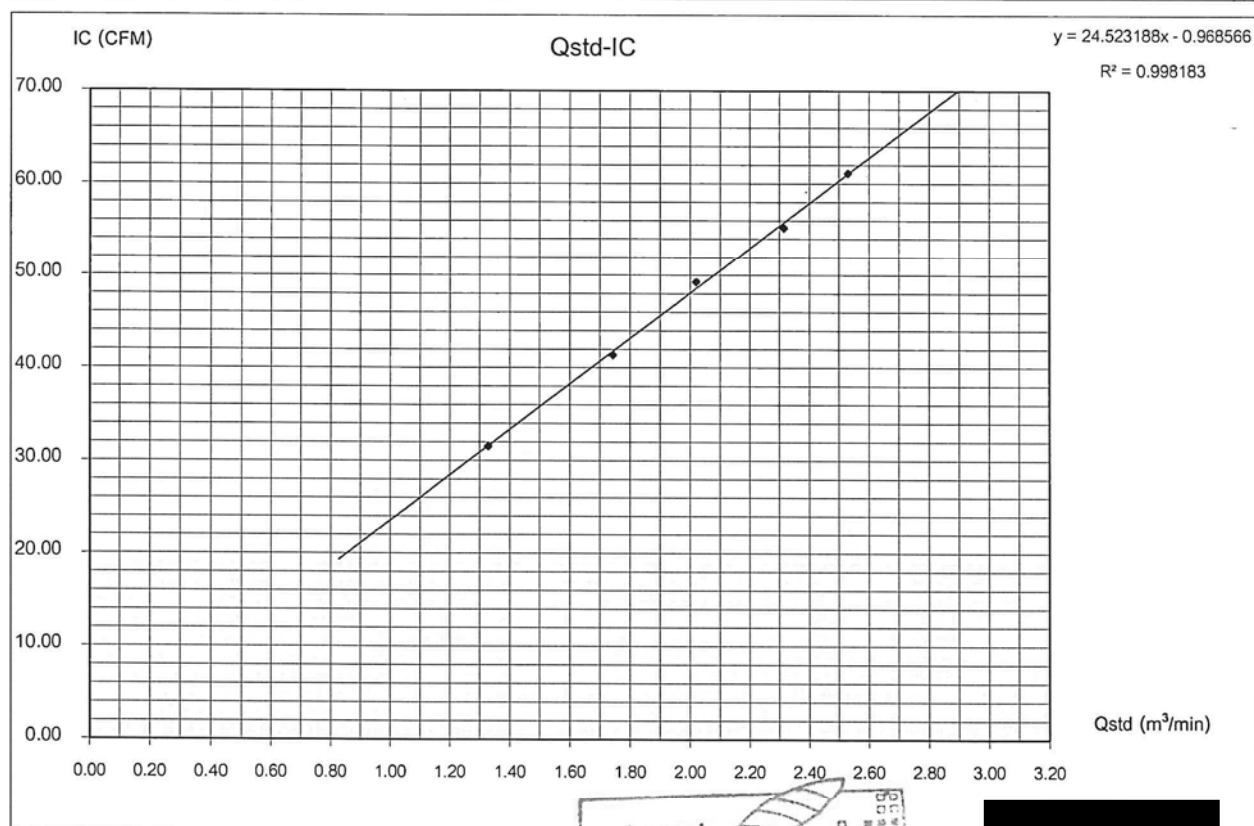
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	June 16, 2023
ชุมชนบ้านหนอง (2023-00883)				Start Time	3:55 PM
Sampler Number	TSP No.A29	Transfer Standard Type	Orifice	Stop Time	4:05 PM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Aakarawit Boonsong
Motor Serial Number	2014-02	Calibrator Serial Number	2716		
Recorder Serial Number	2135				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
	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)	Sample Flow Rate Indication (ft ³ /min)	$ C = \{[(Pa/P_{std})(T_{std}/Ta)]^{1/2}\}$	("K = °C+273)	(mmHg)		
	Positive	Negative	ΔH ₂ O								
5	1.5	1.5	3.0	1.70868	1.32695	32.0	31.57	305.0	757.0		
7	2.6	2.6	5.2	2.24958	1.74284	42.0	41.43	305.0	757.0		
10	3.5	3.5	7.0	2.61005	2.02000	50.0	49.33	305.0	757.0		
13	4.6	4.6	9.2	2.99222	2.31385	56.0	55.24	305.0	757.0		
18	5.5	5.5	11.0	3.27187	2.52887	62.0	61.16	305.0	757.0		
Linear Regression Y ON X : Y= mX + b							Average	305.0	757.0		
1	Slope (m)			1.30058	Linear Equation			r ²	0.998183	Pstd(mmHg)	760.0
2	Intercept (b)			-0.01713	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9990911	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99953	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)			0.973192407
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5			0.986505148

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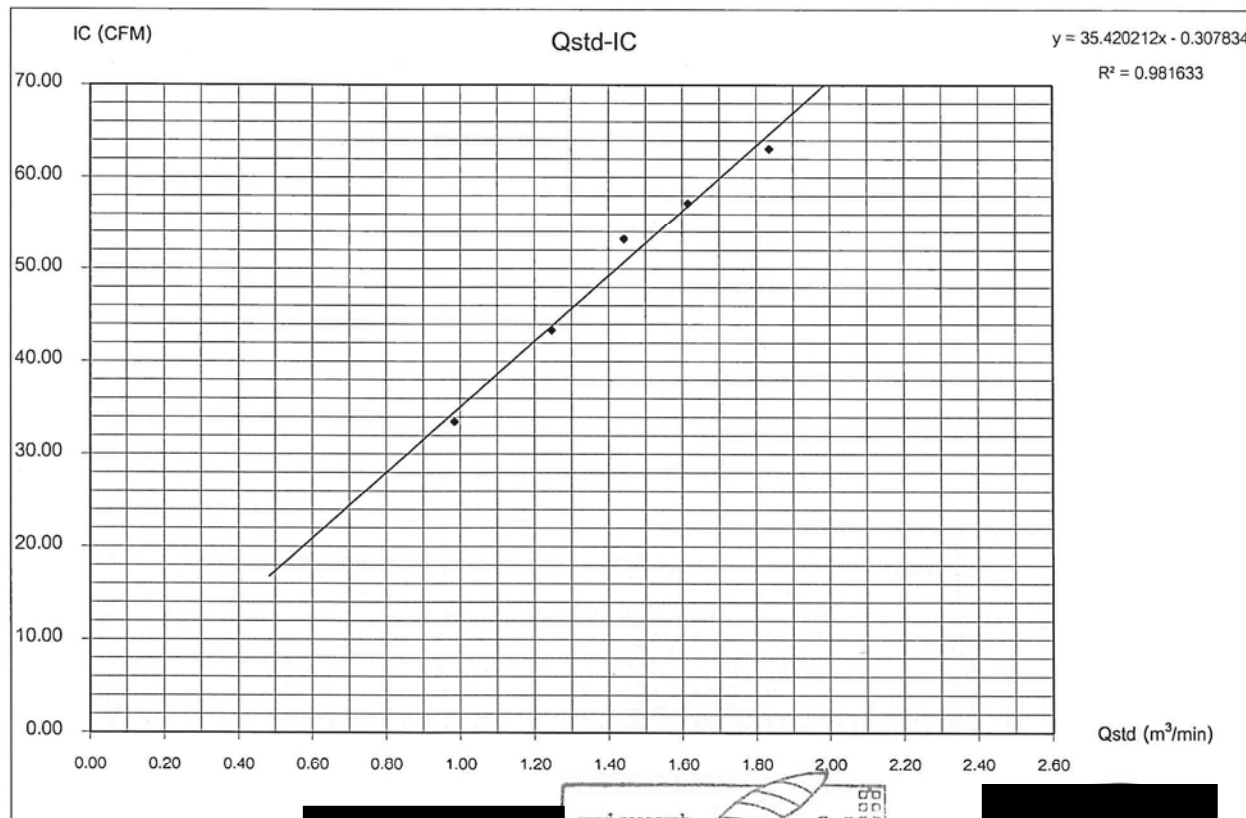
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	June 16, 2023
ชุมชนบ้านใหม่ (2023-00883)				Start Time	2:35 PM
Sampler Number	PM-10 No.18	Transfer Standard Type	Orifice	Stop Time	2:45 PM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Akarawit Boonsong
Motor Serial Number	2139	Calibrator Serial Number	2716		
Recorder Serial Number	2390				

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)	Sample 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	1.7	1.7	3.4	1.81903	0.98397	34.0	33.54	305.0	757.0		
7	2.7	2.7	5.4	2.29243	1.24521	44.0	43.41	305.0	757.0		
10	3.6	3.6	7.2	2.64707	1.44092	54.0	53.27	305.0	757.0		
13	4.5	4.5	9.0	2.95952	1.61334	58.0	57.22	305.0	757.0		
18	5.8	5.8	11.6	3.35992	1.83430	64.0	63.14	305.0	757.0		
Linear Regression Y ON X: Y= mX + b							Average	305.0	757.0		
1	Slope (m)			1.81211	Linear Equation			r ²	0.981633	Pstd(mmHg)	760.0
2	Intercept (b)			0.03597	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9907739	T _{NTP}	298.15
3	Correlation Coefficient (r)			0.99999	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.973192407	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.986505148	

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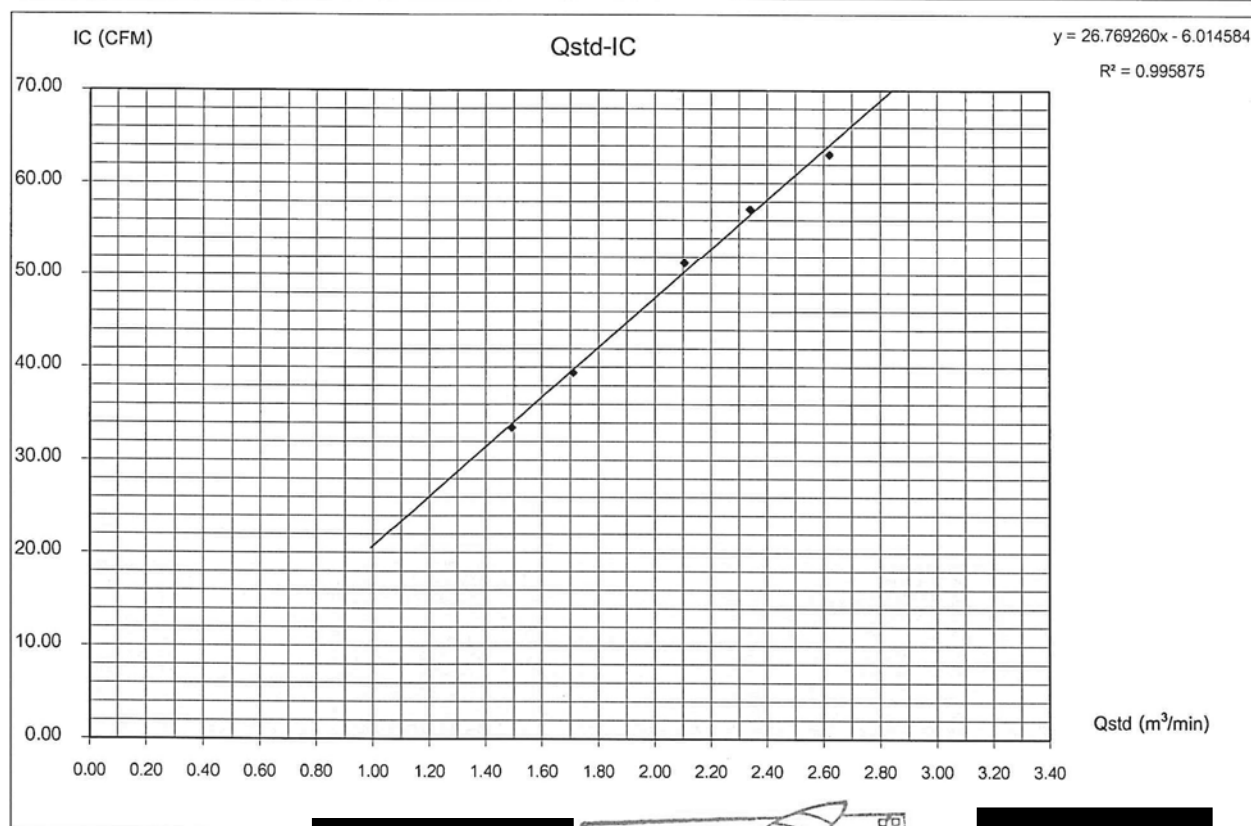
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	June 16, 2023
ชุมชนบ้านใหม่ (2023-00883)				Start Time	2:45 PM
Sampler Number	TSP No.A23	Transfer Standard Type	Onifice	Stop Time	2:55 PM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Aakarawit Boonsong
Motor Serial Number	2055	Calibrator Serial Number	2716		
Recorder Serial Number	2186				

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)	sample Flow Rate Indicator (ft ³ /min)	IC = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	(*K = *C+273)	(mmHg)		
	Positive	Negative	ΔH ₂ O								
5	1.9	1.9	3.8	1.92305	1.49178	34.0	33.54	305.0	757.0		
7	2.5	2.5	5.0	2.20589	1.70925	40.0	39.46	305.0	757.0		
10	3.8	3.8	7.6	2.71961	2.10424	52.0	51.30	305.0	757.0		
13	4.7	4.7	9.4	3.02457	2.33872	58.0	57.22	305.0	757.0		
18	5.9	5.9	11.8	3.38876	2.61874	64.0	63.14	305.0	757.0		
Linear Regression Y ON X : Y= mX + b							Average	305.0	757.0		
1	Slope (m)			1.30058	Linear Equation			r ²	0.995875	Pstd(mmHg)	760.0
2	Intercept (b)			-0.01713	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9979354	T _{NTP}	298.0
3	Correlation Coefficient (r)			0.99953	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.973192407	
Result								C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.986505148	

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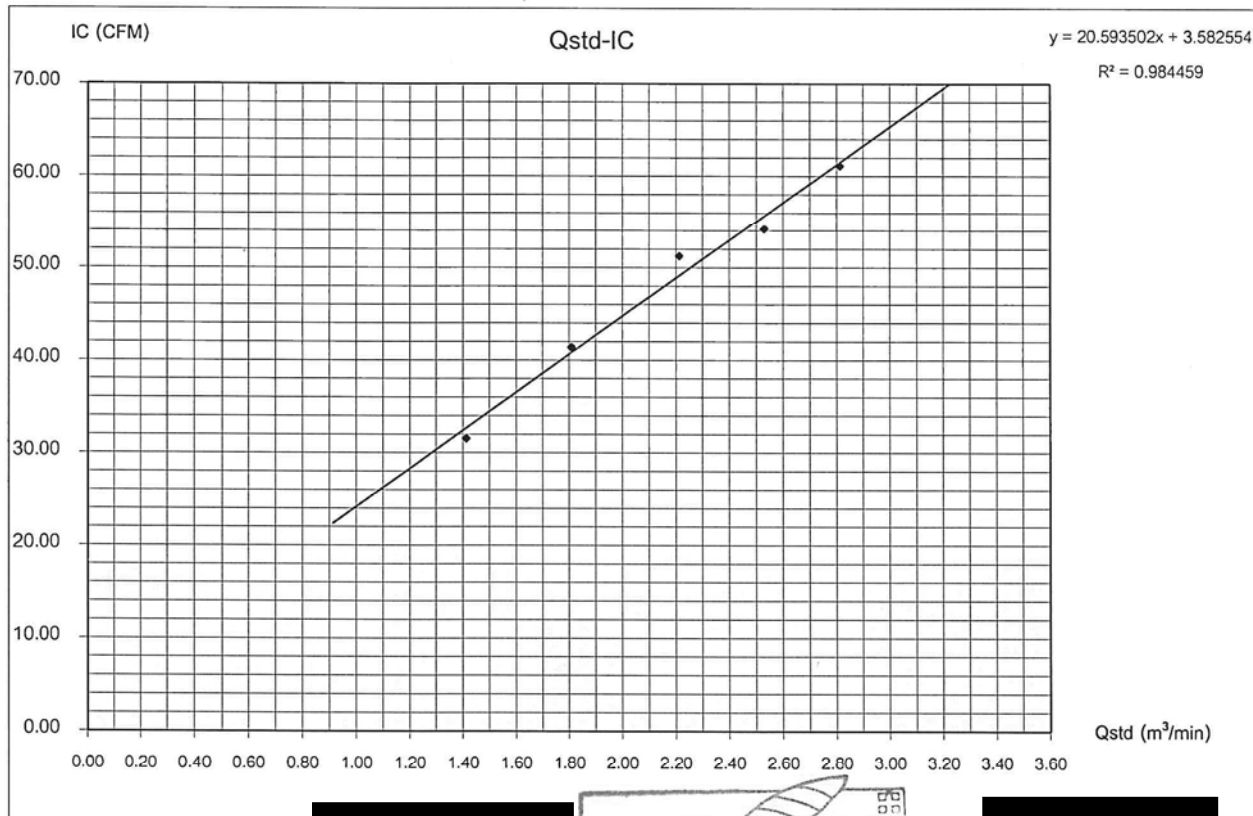
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	June 16, 2023
อบต.บ่อโพธิ์ (2023-00883)				Start Time	10:10 AM
Sampler Number	PM-10 No.26	Transfer Standard Type	Orifice	Stop Time	10:20 AM
Instrument Model	HIVOL-BMBBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Akarawit Boonsong
Motor Serial Number	2211	Calibrator Serial Number	2716		
Recorder Serial Number	2610				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter	
	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)	sample Flow Rate Indication (ft ³ /min)	$ C = I[(Pa/P_{std})(T_{std}/Ta)]^{1/2}$	("K = °C+273)	(mmHg)			
	Positive	Negative	ΔH ₂ O									
5	1.7	1.7	3.4	1.81903	1.41180	32.0	31.57	305.0	757.0			
7	2.8	2.8	5.6	2.33450	1.80814	42.0	41.43	305.0	757.0			
10	4.2	4.2	8.4	2.85916	2.21155	52.0	51.30	305.0	757.0			
13	5.5	5.5	11.0	3.27187	2.52887	55.0	54.26	305.0	757.0			
18	6.8	6.8	13.6	3.63805	2.81042	62.0	61.16	305.0	757.0			
Linear Regression Y ON X : Y= mX + b							Average	305.0	757.0			
1	Slope (m)			1.30058	Linear Equation			r ²	0.984459	Pstd(mmHg)	760.0	
2	Intercept (b)			-0.01713	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9921991	T _{NTP}	298.0	
3	Correlation Coefficient (r)			0.99953	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.973192407		
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.986505148	

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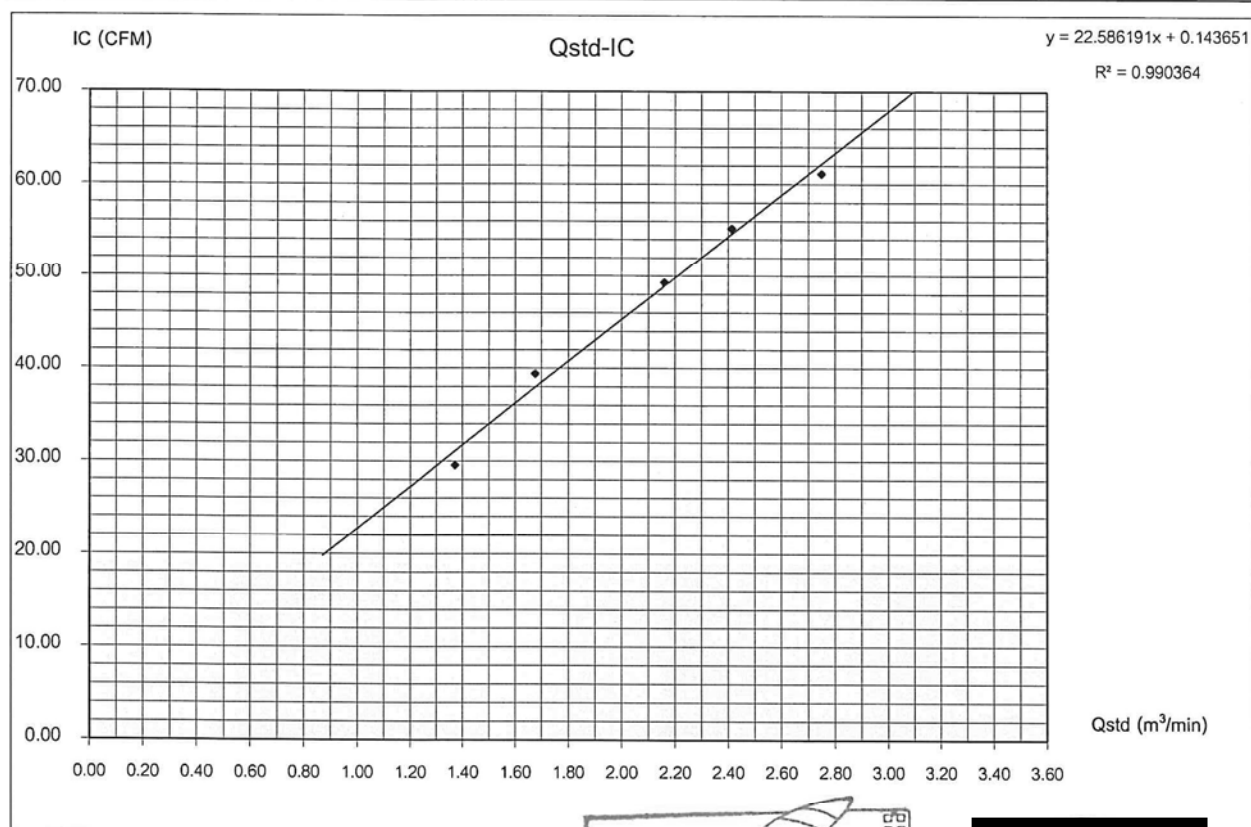
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location				Date	June 16, 2023
อบต.ปอโศก (2023-00883)				Start Time	10:20 AM
Sampler Number	TSP No.5	Transfer Standard Type	Orifice	Stop Time	10:30 AM
Instrument Model	HIVOL-BBCBE	Calibrator Model	TE-5025A	Calibrated By	Mr.Aakarawit Boonsong
Motor Serial Number	1203431	Calibrator Serial Number	2716		
Recorder Serial Number	4640				

Plate No.	(Delta H)			(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop	
	Pressure Drop Across Orifice (inH ₂ O)			[ΔH ₂ O(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	Qstd = (1/m)[(A-b)]	sample Flow Rate Indication	C = I[(Pa/P _{std})(T _{std} /Ta)] ^{1/2}	("K = °C+273)	Pressure	Meter	Meter	
	Positive	Negative	ΔH ₂ O									(m ³ /min)
5	1.6	1.6	3.2	1.76471	1.37004	30.0	29.60	305.0	757.0			
7	2.4	2.4	4.8	2.16132	1.67499	40.0	39.46	305.0	757.0			
10	4.0	4.0	8.0	2.79026	2.15857	50.0	49.33	305.0	757.0			
13	5.0	5.0	10.0	3.11960	2.41180	56.0	55.24	305.0	757.0			
18	6.5	6.5	13.0	3.55689	2.74802	62.0	61.16	305.0	757.0			
Linear Regression Y ON X : Y= mX + b							Average	305.0	757.0			
1	Slope (m)			1.30058	Linear Equation			r ²	0.990364	Pstd(mmHg)	760.0	
2	Intercept (b)			-0.01713	Set Point Flow Rate (X) (m ³ /min)		1.133	r	0.9951703	T _{NTP}	298.0	
3	Correlation Coefficient (r)			0.99953	Final Set Flow Rate = (I)		0	(Pa/Pstd)*(Tstd/Ta)		0.973192407		
Result									C=(Pa/Pstd)*(Tstd/Ta)^0.5		0.986505148	

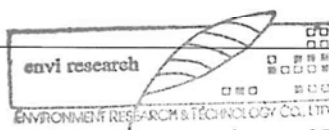
COMMENT

Andersen Instruments, Inc.



Checked By

Technician



Approved By

Environmental Scientist

Mettler-Toledo (Thailand) Ltd.



Accuracy Calibration Certificate

Customer

Company: Environment Research & Technology Co., Ltd.
Address: 25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Rd., Toongsonghong
City: Laksi **Contact:** [Redacted]
Zip / Postal: 10210
State / Province: Bangkok
Order Number: 
* 0 3 3 2 6 1 7 8 5 6 *

Weighing Device

Manufacturer: Mettler Toledo **Instrument Type:** Weighing Instrument
Model: AB204-S **Asset Number:** ERTC-L-IN-0048
Serial No.: 1123103723 **Terminal Model:** N/A
Building: N/A **Terminal Serial No.:** N/A
Floor: 4 **Terminal Asset No.:** N/A
Room: 406

Range	Max. Capacity	Readability (d)
1	220 g	0.0001 g

Procedure

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

This calibration certificate contains measurements for As Found and As Left calibrations.

The sensitivity/span of the weighing instrument was adjusted before As Found and As Left calibrations with a built-in weight.

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

	Temperature		Humidity	
As Found	Start: 23.6 °C	End: 23.5 °C	Start: 34.6 %	End: 35.1 %
As Left	Start: 23.6 °C	End: 23.5 °C	Start: 35.0 %	End: 35.7 %

As Found Calibration Date: 17-Jan-2023 **Calibrator:** [Redacted]
As Left Calibration Date: 17-Jan-2023
Issue Date: 19-Jan-2023
Approved Signatory: [Redacted]
Technical Manager / Head of Calibration Center

Measurement Results

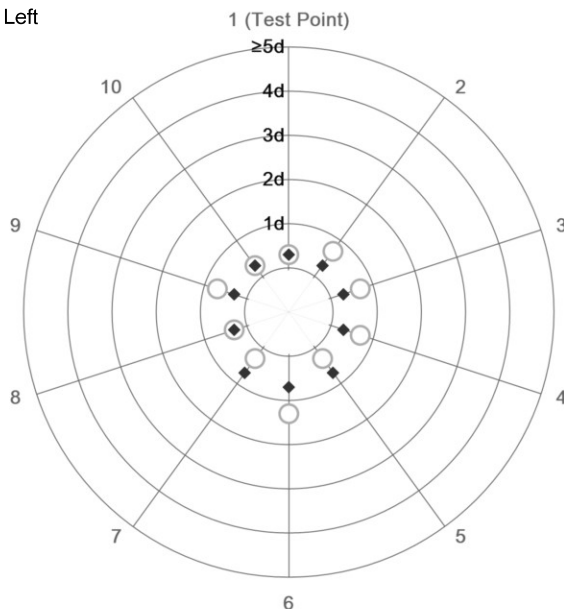
Repeatability

Test Load: 100 g

	As Found	As Left
1	99.9992 g	100.0001 g
2	99.9991 g	100.0001 g
3	99.9991 g	100.0001 g
4	99.9991 g	100.0001 g
5	99.9992 g	100.0002 g
6	99.9993 g	100.0002 g
7	99.9992 g	100.0002 g
8	99.9992 g	100.0001 g
9	99.9991 g	100.0001 g
10	99.9992 g	100.0001 g

Standard Deviation	0.00007 g	0.00005 g
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○ As Found
◆ As Left



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

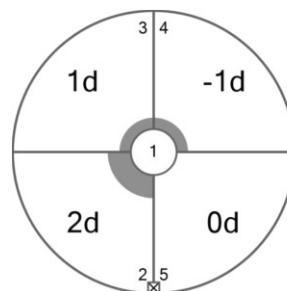
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

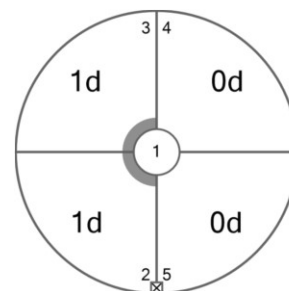
Test Load: 100 g

Position	As Found	As Left
1	99.9991 g	100.0001 g
2	99.9993 g	100.0002 g
3	99.9992 g	100.0002 g
4	99.9990 g	100.0001 g
5	99.9991 g	100.0001 g

Maximum Deviation	0.0002 g	0.0001 g
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As Found



As Left

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

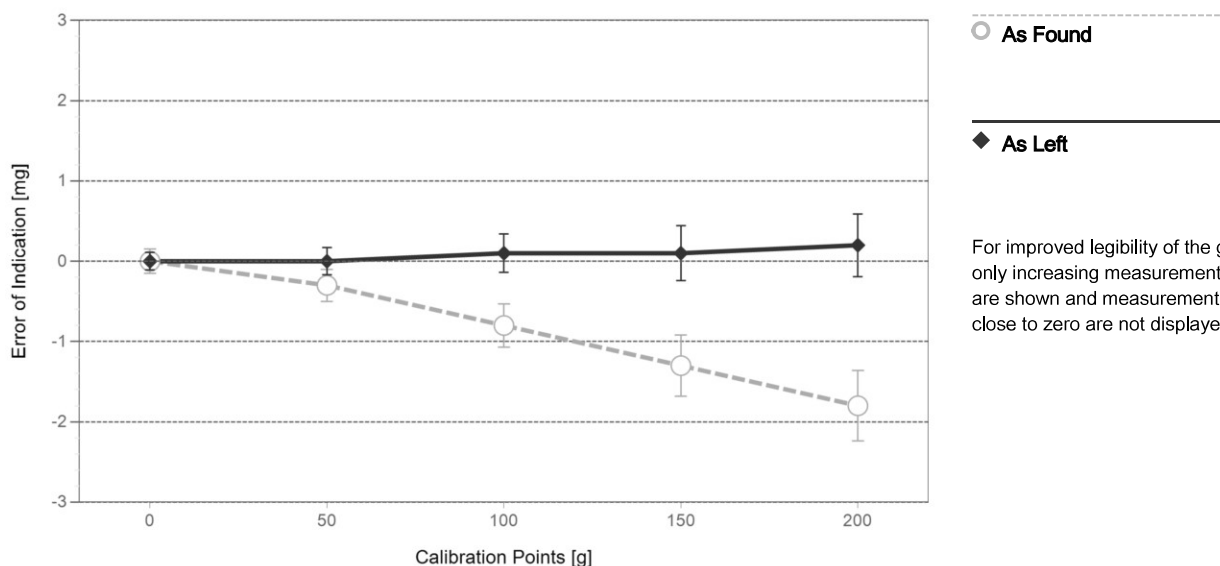
Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.15 mg	2
2	0.0500 g	0.0500 g	0.0000 g	0.16 mg	2
3	0.1000 g	0.0999 g	-0.0001 g	0.16 mg	2
4	0.5000 g	0.4999 g	-0.0001 g	0.16 mg	2
5	1.0000 g	1.0000 g	0.0000 g	0.16 mg	2
6	5.0000 g	5.0001 g	0.0001 g	0.16 mg	2
7	10.0000 g	10.0001 g	0.0001 g	0.17 mg	2
8	50.0000 g	49.9997 g	-0.0003 g	0.20 mg	2
9	100.0000 g	99.9992 g	-0.0008 g	0.27 mg	2
10	150.0000 g	149.9987 g	-0.0013 g	0.38 mg	2
11	200.0000 g	199.9982 g	-0.0018 g	0.44 mg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.11 mg	2
2	0.0500 g	0.0500 g	0.0000 g	0.13 mg	2
3	0.1000 g	0.1000 g	0.0000 g	0.13 mg	2
4	0.5000 g	0.5000 g	0.0000 g	0.13 mg	2
5	1.0000 g	1.0000 g	0.0000 g	0.13 mg	2
6	5.0000 g	5.0001 g	0.0001 g	0.13 mg	2
7	10.0000 g	10.0000 g	0.0000 g	0.14 mg	2
8	50.0000 g	50.0000 g	0.0000 g	0.17 mg	2
9	100.0000 g	100.0001 g	0.0001 g	0.24 mg	2
10	150.0000 g	150.0001 g	0.0001 g	0.34 mg	2
11	200.0000 g	200.0002 g	0.0002 g	0.39 mg	2



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

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

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

Weight Set 1: OIML E2

Weight Set No.:	WS57	Date of Issue:	06-Jan-2022
Certificate Number:	177037	Calibration Due Date:	03-Jul-2023

Thermo Hygrometer

Equipment No.:	IN255	Date of Issue:	20-Jul-2022
Certificate Number:	22H1503	Calibration Due Date:	04-Jul-2023

Remarks

Equipment condition: Good

Next calibration according to customer's procedure

Calibration data not decide by calibration laboratory

End of Accredited Section

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

Measurement Uncertainty of the Weighing Instrument in Use

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

Temperature coefficient for the evaluation of the measurement uncertainty in use: $3.0 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 3 K

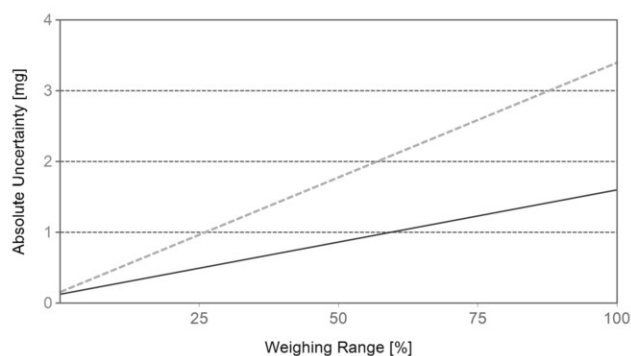
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0.0001 g	220 g	$U_1 = 0.16 \text{ mg} + 0.0147 \text{ mg/g} \cdot R$	$U_1 = 0.13 \text{ mg} + 0.00671 \text{ mg/g} \cdot R$

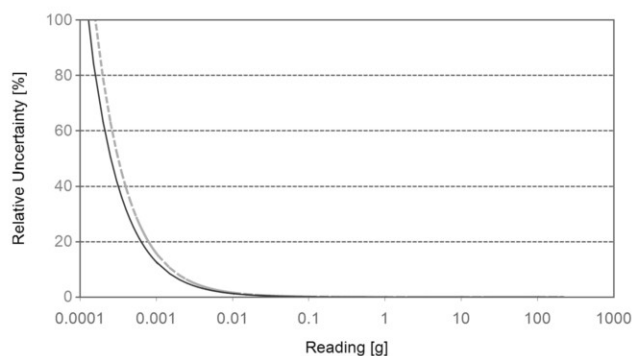
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found		As Left	
0.0220 g	0.16 mg	0.73%	0.13 mg	0.59%
0.2200 g	0.16 mg	0.074%	0.13 mg	0.060%
2.2000 g	0.19 mg	0.0087%	0.14 mg	0.0066%
22.0000 g	0.48 mg	0.0022%	0.28 mg	0.0013%
220.0000 g	3.4 mg	0.0015%	1.6 mg	0.00073%



As Found



As Left

GWP® Certificate



**As
Found**



**As
Left**



The weighing device meets the given process requirements.

The weighing device meets the given process requirements.

Tests Performed:



As Found



As Left

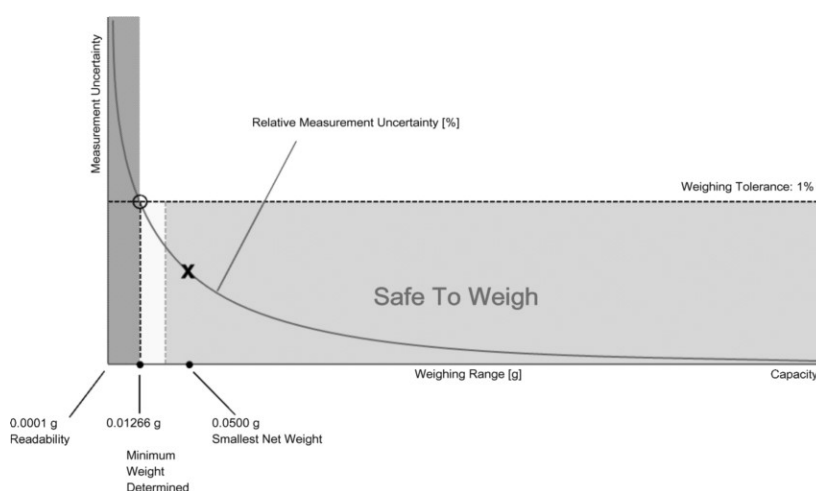
Process Requirements

Weighing Tolerance: **1%**

Smallest Net Weight: **0.0500 g**

Safety Factor: **2**

Safe Weighing Range



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

Minimum Weight

As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.16012 g	0.32511 g	0.49518 g	0.85155 g	1.85026 g
0.2%	0.07947 g	0.16012 g	0.24199 g	0.40949 g	0.85155 g
0.5%	0.03165 g	0.06348 g	0.09550 g	0.16012 g	0.32511 g
1%	0.01580 g	0.03165 g	0.04754 g	0.07947 g	0.16012 g
2%	0.00789 g	0.01580 g	0.02372 g	0.03959 g	0.07947 g
5%	0.00316 g	0.00631 g	0.00947 g	0.01580 g	0.03165 g



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

As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
	Safety Factor				
Tolerance	1	2	3	5	10
0.1%	0.12735 g	0.25642 g	0.38726 g	0.65440 g	1.35584 g
0.2%	0.06346 g	0.12735 g	0.19166 g	0.32162 g	0.65440 g
0.5%	0.02533 g	0.05073 g	0.07620 g	0.12735 g	0.25642 g
1%	0.01266 g	0.02533 g	0.03802 g	0.06346 g	0.12735 g
2%	0.00633 g	0.01266 g	0.01899 g	0.03168 g	0.06346 g
5%	0.00253 g	0.00506 g	0.00759 g	0.01266 g	0.02533 g



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

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

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

Notes on minimum weight values in above table:

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

Measurement Results

Results Summary

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

✓ = Passed

✗ = Failed

⚠ = Safety Factor not met

Repeatability

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	N/A	0.00007 g*	N/A	0.00005 g*	N/A
0.2%	0.00005 g		✗		⚠
0.5%	0.00013 g		✓		✓
1%	0.00025 g		✓		✓
2%	0.00050 g		✓		✓
5%	0.00125 g		✓		✓

*The calculated standard deviation value is below the rounding error of the balance. The 0.41*d rule is used for the assessment of this repeatability test and the calculation of the minimum weight.

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

Eccentricity

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Deviation	Result	Deviation	Result
0.1%	0.0500 g	0.0002 g	✓	0.0001 g	✓
0.2%	0.1000 g		✓		✓
0.5%	0.2500 g		✓		✓
1%	0.5000 g		✓		✓
2%	1.0000 g		✓		✓
5%	2.5000 g		✓		✓

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

Error of Indication**As Found**

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
50.0000 g	-0.0003 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
100.0000 g	-0.0008 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0000 g	-0.0013 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0000 g	-0.0018 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

As Left

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A
50.0000 g	0.0000 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g
100.0000 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0000 g	0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0000 g	0.0002 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

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



by Mesa Labs

PQ200 Certificate of Compliance

This certifies that this instrument has been built and calibrated
by Mesa Labs following released procedures.

PQ200 Serial #: 90028

- Flow Rate: 16.7 lpm (MP-00967)
- Barometric Pressure Calibration (MP-00965)
- Temperature Probe Calibration (MP-00964)
- Leak Test (MP-00966)

VSCC Serial #: 178661 Date of Test: 30MAR2022

Complete

Date: 30MAR2022

Signature

Approved By: _____
Quality Technician

Date: 30Mar2022

Signature: _____

Calibration Data of NOx Analyzer

Analyzer Performance Test

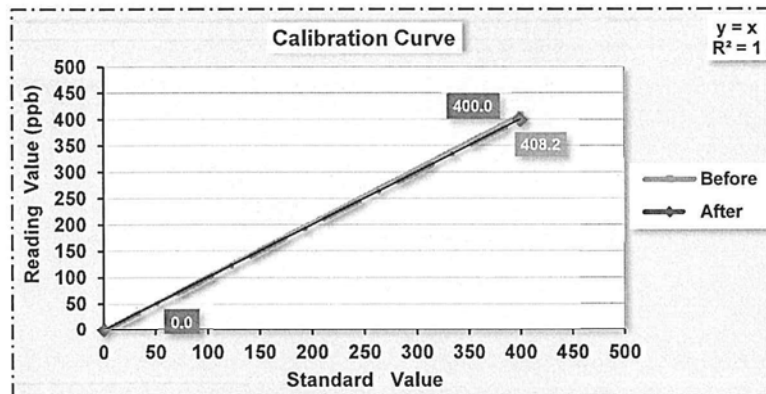
Equipment	Gas Analyzer (NOx)	Customer Name	ทีแอลที คอนซัลแตนท์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Quotation	2023-00883
Serial No.	M4286P23	Calibration Date	May 24, 2023
Analyzer Unit	ppb	Time	1:29 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	0.8	0.0	-0.1	0.0	0.9	0.0	-	-	-
Span	400	416.9	400.0	408.2	400.0	8.7	0.0	-	-	2.1

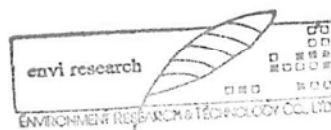


STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal NO	mV	1.0	0.7	Voltage of the measured NO value
Signal NOx	mV	8.2	7.7	Voltage of the measured NOx value
Detector	°C	42.0	42.0	43 °C ± 5 °C
Ambient	kPa	101.1	101.0	Current atmospheric pressure
DC 24V	V	23.8	23.8	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	1.09390	1.07250	0.50000 - 2.0000
NOx Slope	-	1.07470	1.03100	0.50000 - 2.0000

Calibrate By :

May 24, 2023



Checked By :

May 24, 2023

Calibration Data of NOx Analyzer

Analyzer Performance Test

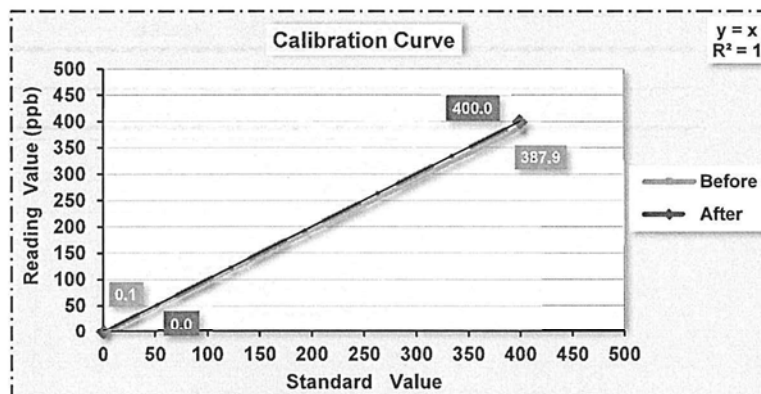
Equipment	Gas Analyzer (NOx)	Customer Name	ทีแอลที คอนซัลแตนท์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Quotation	2023-00883
Serial No.	J6GUBA4N	Calibration Date	May 22, 2023
Analyzer Unit	ppb	Time	3:36 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	0.1	0.0	0.1	0.0	0.0	0.0	-	-	-
Span	400	408.4	400.0	387.9	400.0	20.5	0.0	-	-	3.0

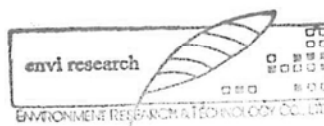


STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal NO	mV	0.5	0.8	Voltage of the measured NO value
Signal NOx	mV	8.6	8.2	Voltage of the measured NOx value
Detector	°C	42.1	42.1	43 °C ± 5 °C
Ambient	kPa	101.3	101.2	Current atmospheric pressure
DC 24V	V	238.0	23.8	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	0.84006	0.86958	0.50000 - 2.0000
NOx Slope	-	0.88002	0.86469	0.50000 - 2.0000

Calibrate By :

May 22, 2023



Checked By :

May 22, 2023

Calibration Data of NOx Analyzer

Analyzer Performance Test

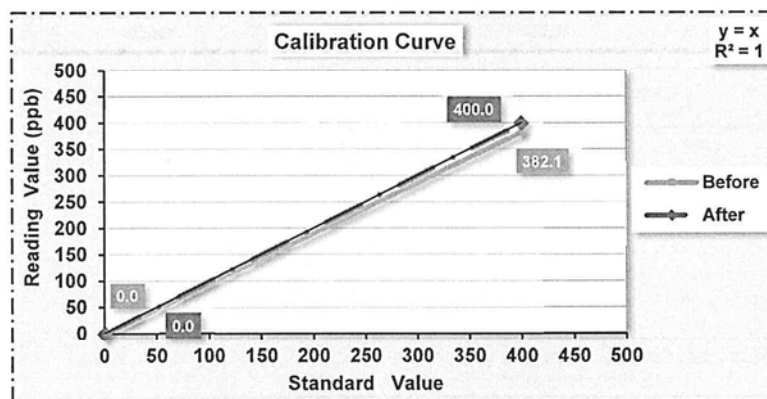
Equipment	Gas Analyzer (NOx)	Customer Name	ทีแอลที คอนซิลแตนต์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Quotation	2023-00883
Serial No.	R9CLG7JS	Calibration Date	May 3, 2023
Analyzer Unit	ppb	Time	10:31 AM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	-0.2	0.0	0.0	0.0	-0.2	0.0	-	-	-
Span	400	385.6	400.0	382.1	400.0	3.5	0.0	-	-	4.5

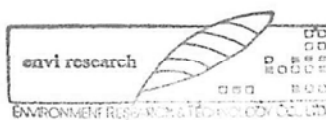


STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal NO	mV	1.3	1.1	Voltage of the measured NO value
Signal NOx	mV	19.8	12.9	Voltage of the measured NOx value
Detector	°C	42.2	42.3	43 °C ± 5 °C
Ambient	kPa	101.8	101.7	Current atmospheric pressure
DC 24V	V	23.8	23.8	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	1.06660	1.17750	0.50000 - 2.0000
NOx Slope	-	1.04210	1.10980	0.50000 - 2.0000

Calibrate By :

May 3, 2023



Checked By :

May 3, 2023

Calibration Data of NOx Analyzer

Analyzer Performance Test

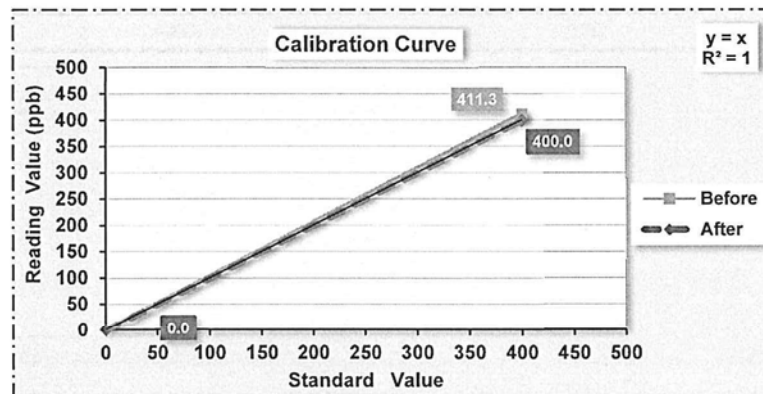
Equipment	Gas Analyzer (NOx)	Customer Name	ทีแอลที คอนซัลแตนท์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Quotation	2023-00883
Serial No.	4VWFEBUK	Calibration Date	May 24, 2023
Analyzer Unit	ppb	Time	1:39 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	-0.1	0.0	-0.1	0.0	0.0	0.0	-	-	-
Span	400	384.8	400.0	411.3	400.0	-26.5	0.0	-	-	2.8

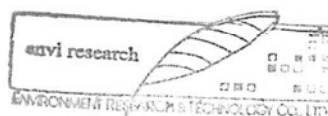


STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal NO	mV	0.8	1.2	Voltage of the measured NO value
Signal NOx	mV	10.1	9.8	Voltage of the measured NOx value
Detector	°C	41.5	41.5	43 °C ± 5 °C
Ambient	kPa	100.4	100.3	Current atmospheric pressure
DC 24V	V	23.5	23.5	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	0.78090	0.76020	0.50000 - 2.0000
NOx Slope	-	0.69670	0.78580	0.50000 - 2.0000

Calibrate By :

May 24, 2023



Checked By :

May 24, 2023

Calibration Data of NOx Analyzer

Analyzer Performance Test

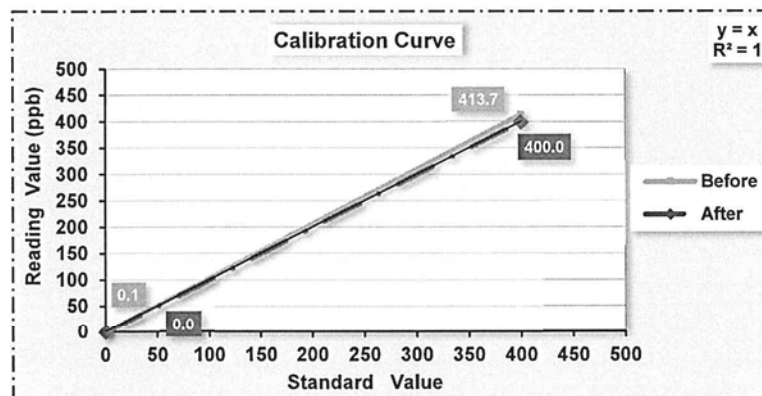
Equipment	Gas Analyzer (NOx)	Customer Name	ทีแอลที คอนซัลแตนท์
Manufacture	HORIBA	Location	Envi Research
Model	APNA-370	Quotation	2023-00883
Serial No.	NKDVFYFRX	Calibration Date	June 9, 2023
Analyzer Unit	ppb	Time	2:36 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value								% Abs Error
		NO _x (ppb)		NO (ppb)		NO ₂ (ppb)		Stability		
		Before	After	Before	After	Before	After	Before	After	
Zero	0	-0.2	0.0	0.1	0.0	-0.3	0.0	-	-	-
Span	400	422.5	400.0	413.7	400.0	8.8	0.0	-	-	3.4



STATUS TEST AND VALIDATION OF NOx ANALYZER MODEL APNA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal NO	mV	1.3	1.6	Voltage of the measured NO value
Signal NOx	mV	14.7	15.9	Voltage of the measured NOx value
Detector	°C	41.9	42.0	43 °C ± 5 °C
Ambient	kPa	100.9	100.9	Current atmospheric pressure
DC 24V	V	23.9	23.9	24V ±0.5
DC 5V	V	5.0	5.0	5V ±0.5
NO Slope	-	1.09270	1.05710	0.50000 - 2.0000
NOx Slope	-	1.09270	1.03430	0.50000 - 2.0000

Calibrate By :



June 9, 2023



Checked By :



June 9, 2023

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

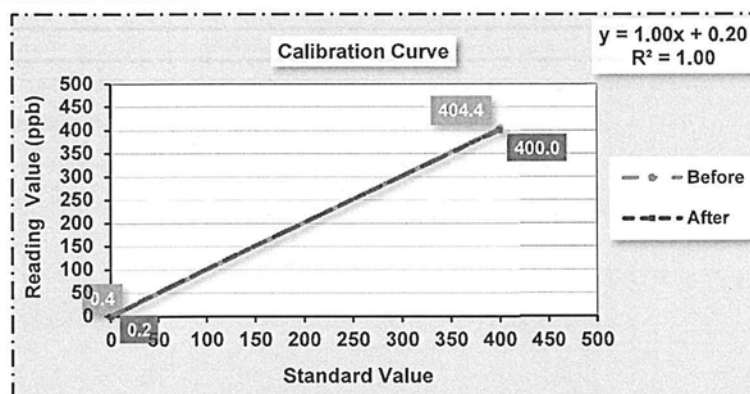
Equipment	Gas Analyzer (SO ₂)	Customer Name	ทีแอลที คอนซัลแตนท์
Manufacture	Thermo	Location	Envi Research
Model	43C	Quotation	2023-00883
Serial No.	64389-343/2	Calibration Date	June 15, 2023
Analyzer Unit	ppb	Time	4:29 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppb)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	0.4	0.2	-	-	-
Span	400	404.4	400.0	-	-	1.1



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL 43C

Parameter	Display As	Unit	Observed Value		Nominal Range
			Before Adjust	After Adjust	
Range	RANGE	ppb	500	500	0 - 500 standard
Internal Temperature	INTERNAL	°C	31.4	33.0	8.0 °C to 47.0 °C
Chamber Temp	CHAMBER	°C	45.5	45.5	43.0 °C to 47.0 °C
Pressure	PRESSURE	mmHg	660.6	660.6	400.0 to 1,000
Sample Flow	SAMP FLOW	LPM	0.580	0.581	0.350 to 1.000
Lamp Intensity	INTENSITY	Hz	30945	30899	20,000 to 50,000
Lamp Voltage	LAMP VOLTAGE	V	1018	1029	750 to 1,200
SO ₂ Concentration	SO ₂ CONCENTRATION	ppb	3.3	1.4	0 to 10,000
Motherboard Status	MOTHERBOARD STATUS	-	OK	OK	OK
Interface Status	INTERFACE STATUS	-	OK	OK	OK

Calibrate By :

June 15, 2023

Checked By :

June 15, 2023

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

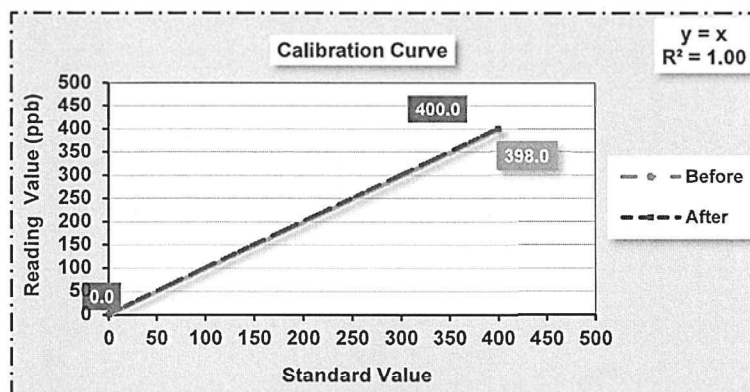
Equipment	Gas Analyzer (SO ₂)	Customer Name	ทีแอลที คอนซิลแดนส์
Manufacture	Thermo	Location	Envi Research
Model	43C	Quotation	2023-00883
Serial No.	0335804022	Calibration Date	June 15, 2023
Analyzer Unit	ppb	Time	4:26 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppb)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	-0.2	0.0	-	-	-
Span	400	398.0	400.0	-	-	0.5



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL 43C

Parameter	Display As	Unit	Observed Value		Nominal Range
			Before Adjust	After Adjust	
Range	RANGE	ppb	500	500	0 - 500 standard
Internal Temperature	INTERNAL	°C	39.3	33.2	8.0 °C to 47.0 °C
Chamber Temp	CHAMBER	°C	44.8	44.5	43.0 °C to 47.0 °C
Pressure	PRESSURE	mmHg	754.0	761.9	400.0 to 1,000
Sample Flow	SAMP FLOW	LPM	0.355	0.371	0.350 to 1.000
Lamp Intensity	INTENSITY	Hz	23	24364	20,000 to 50,000
Lamp Voltage	LAMP VOLTAGE	V	914	830	750 to 1,200
SO ₂ Concentration	SO ₂ CONCENTRATION	ppb	1.9	1.8	0 to 10,000
Motherboard Status	MOTHERBOARD STATUS	-	OK	OK	OK
Interface Status	INTERFACE STATUS	-	OK	OK	OK

Calibrate By :

June 15, 2023



Checked By :

June 15, 2023

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

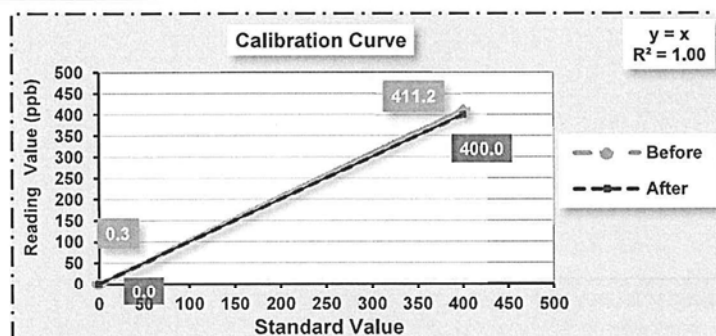
Equipment	Gas Analyzer (SO ₂)	Customer Name	ทีแอลที คอนซัลแตนท์
Manufacture	Horiba	Location	Envi Research
Model	APSA-370	Quotation	2023-00883
Serial No.	V4HC9062	Calibration Date	June 2, 2023
Analyzer Unit	ppb	Time	1:55 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppb)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	0.3	0.0	-	-	-
Span	400	411.2	400.0	-	-	2.8



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL APSA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal (SO ₂)	mV	12.4	12.9	Voltage of the measured SO ₂ value
LAMP	mV	223.8	221.9	200 mV - 1200 mV
CELL	°C	34.9	35.3	Ambient temperature + 5 °C - 15 °C
PUMP	Kpa	45.4	45.4	65 kPa or less
AMBIENT	kPa	101.0	101.0	Current atmospheric pressure
DC 24V	V	24.0	24.0	24 V ±0.5 V
DC 5V	V	4.9	4.9	5 V ±0.5 V

Calibrate By :

June 2, 2023



Checked By :

June 2, 2023

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

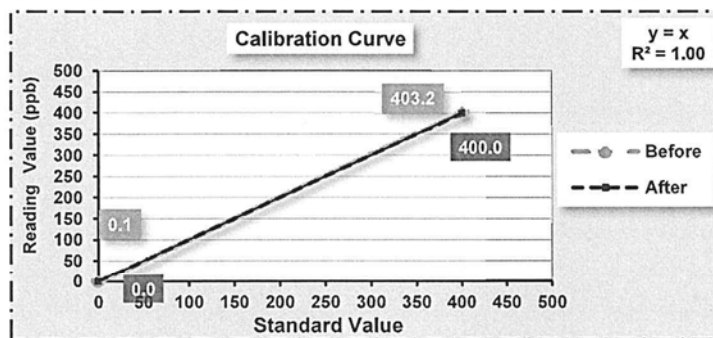
Equipment	Gas Analyzer (SO ₂)	Customer Name	ทีแอลที คอนซัลแตนท์
Manufacture	Horiba	Location	Envi Research
Model	APSA-370	Quotation	2023-00883
Serial No.	12E8X34P	Calibration Date	June 1, 2023
Analyzer Unit	ppb	Time	10:56 AM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppb)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	0.1	0.0	-	-	-
Span	400	403.2	400.0	-	-	0.8



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL APSA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal (SO ₂)	mV	3.5	3.5	Voltage of the measured SO ₂ value
LAMP	mV	261.9	262.0	200 mV - 1200 mV
CELL	°C	37.5	38.3	Ambient temperature + 5 °C - 15 °C
PUMP	Kpa	43.7	43.6	65 kPa or less
AMBIENT	kPa	100.6	100.4	Current atmospheric pressure
DC 24V	V	23.9	23.9	24 V ±0.5 V
DC 5V	V	4.9	4.9	5 V ±0.5 V

Calibrate By :

June 1, 2023

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June 1, 2023

Calibration Data of SO₂ Analyzer

Analyzer Performance Test

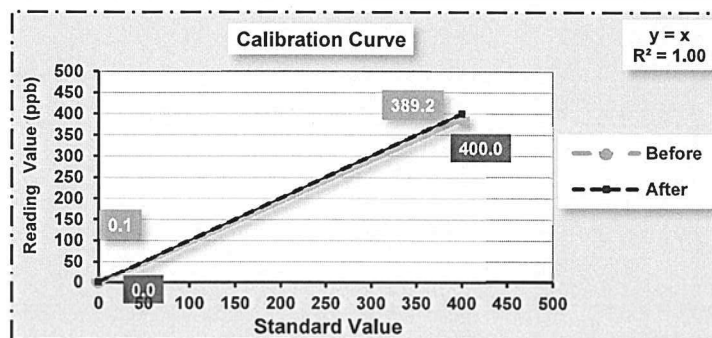
Equipment	Gas Analyzer (SO ₂)	Customer Name	ทีแอลที คอนซัลแตนท์
Manufacture	Horiba	Location	Envi Research
Model	APSA-370	Quotation	2023-00883
Serial No.	X7L602W6	Calibration Date	June 9, 2023
Analyzer Unit	ppb	Time	2:53 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppb)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	0.1	0.0	-	-	-
Span	400	389.2	400.0	-	-	2.7



STATUS TEST AND VALIDATION OF SO₂ ANALYZER MODEL APSA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
Range	ppb	500	500	0 - 500 Standard
Signal (SO ₂)	mV	18.3	20	Voltage of the measured SO ₂ value
LAMP	mV	240.7	240.8	200 mV - 1200 mV
CELL	°C	34.7	34.7	Ambient temperature + 5 °C - 15 °C
PUMP	Kpa	41.2	41.1	65 kPa or less
AMBIENT	kPa	100.3	100.3	Current atmospheric pressure
DC 24V	V	24.0	24.0	24 V ±0.5 V
DC 5V	V	5.0	5.0	5 V ±0.5 V

Calibrate By :

June 9, 2023

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Checked By :

June 9, 2023

Calibration Data of CO Analyzer

Analyzer Performance Test

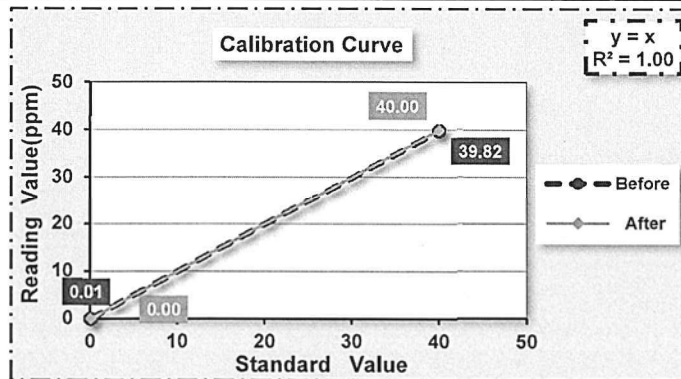
Equipment	Gas Analyzer (CO)	Customer Name	ทีแอลที คอนซัลแตนท์
Manufacture	HORIBA	Location	Envi Research
Model	APMA-360 CE	Quotation	2023-00883
Serial No.	41346760054	Calibration Date	June 12, 2023
Analyzer Unit	ppm	Time	2:29 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppm)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	0.01	0.00	-	-	-
Span	40	39.82	40.00	-	-	0.45

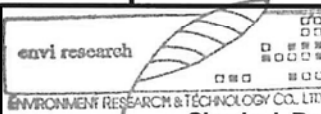


STATUS TEST AND VALIDATION OF CO ANALYZER MODEL APMA-360CE

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
SIGNAL (MAIN)	mV	2.7	2.8	Voltage of the measured CO Value
SIGNALI (COMP)	mV	0.0	0.0	Voltage of the interference component Value
CELL	°C	37.0	37	Ambient + (5 to 15 °C)
SAMPLE	L/min	1.2	1.2	1 L/min to 2 L/min
OVER FLOW	LPM	0.0	0.0	< 1.2

Calibrate By :

June 12, 2023



Checked By :

June 12, 2023

Calibration Data of CO Analyzer

Analyzer Performance Test

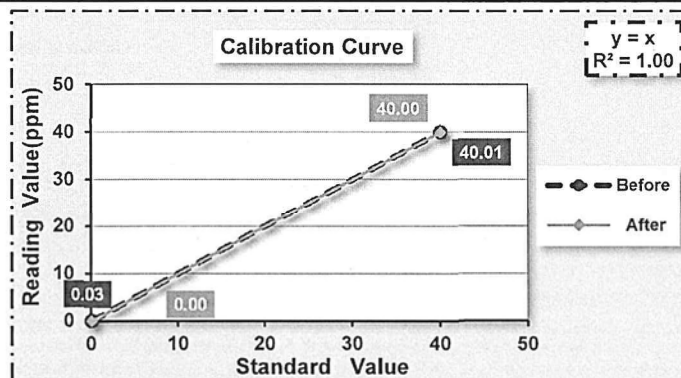
Equipment	Gas Analyzer (CO)	Customer Name	ทีแอลที คอนซัลแตนท์
Manufacture	HORIBA	Location	Envi Research
Model	APMA-360 CE	Quatation	2023-00883
Serial No.	577274012	Calibration Date	June 12, 2023
Analyzer Unit	ppm	Time	2:25 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppm)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	0.03	0.00	-	-	-
Span	40	40.01	40.00	-	-	0.02



STATUS TEST AND VALIDATION OF CO ANALYZER MODEL APMA-360CE

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
SIGNAL (MAIN)	mV	7.4	7.3	Voltage of the measured CO Value
SIGNALI (COMP)	mV	1.0	1.0	Voltage of the interference component Value
CELL	°C	36.4	36.4	Ambient + (5 to 15 °C)
SAMPLE	L/min	1.3	1.3	1 L/min to 2 L/min
OVER FLOW	LPM	0.0	0.0	< 1.2

Calibrate By :

June 12, 2023

Checked By :

June 12, 2023

Calibration Data of CO Analyzer

Analyzer Performance Test

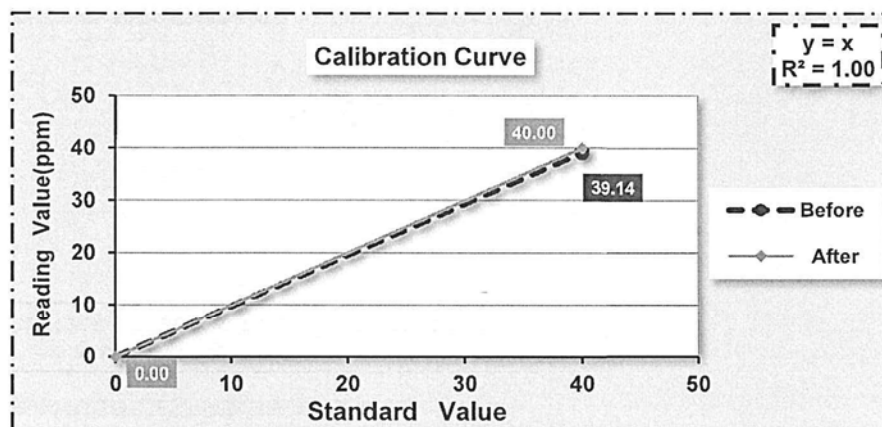
Equipment	Gas Analyzer (CO)	Customer Name	ทีแอลที คอนซัลแตนท์
Manufacture	HORIBA	Location	Envi Research
Model	APMA-370	Quotation	2023-00883
Serial No.	HXA8A4TG	Calibration Date	June 2, 2023
Analyzer Unit	ppm	Time	1:58 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppm)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	-0.01	0.00	-	-	-
Span	40	39.14	40.00	-	-	2.15



STATUS TEST AND VALIDATION OF CO ANALYZER MODEL APMA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
SIGNAL(MAIN)	mV	4.4	3.7	Voltage of the measured CO Value
SIGNAL (COMP)	mV	0.8	0.6	Voltage of the interference component Value
CELL	°C	37.8	37.6	Ambient + (5 to 10 C)
PUMP	kpa	40.0	39.9	less than 65
AMBIENT	kpa	100.9	100.0	Atmospheric pressure
DC 24V	mV	23.9	23.8	24+/- 0.5 V
DC 5V	mV	4.9	4.9	5+/- 0.5 V

Calibrate By :

June 2, 2023

Checked By :

June 2, 2023

Calibration Data of CO Analyzer

Analyzer Performance Test

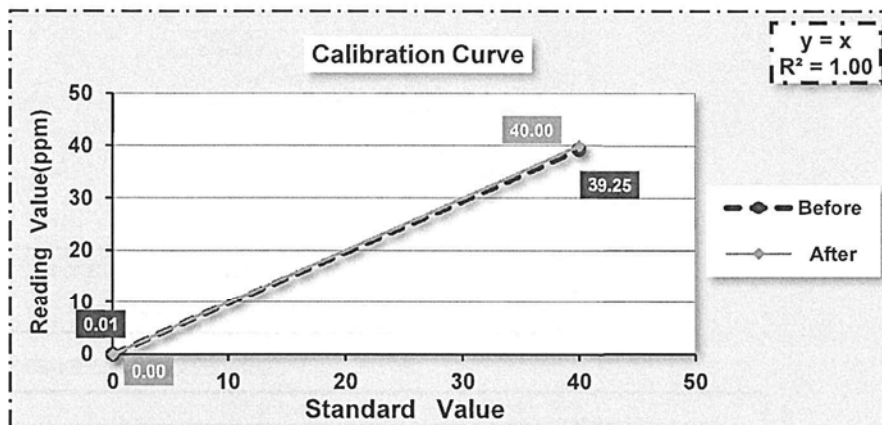
Equipment	Gas Analyzer (CO)	Customer Name	ทีแอลที คอนซัลแตนท์
Manufacture	HORIBA	Location	Envi Research
Model	APMA-370	Quotation	2023-00883
Serial No.	4N02XP27	Calibration Date	June 1, 2023
Analyzer Unit	ppm	Time	1:19 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppm)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	0.01	0.00	-	-	-
Span	40	39.25	40.00	-	-	1.88



STATUS TEST AND VALIDATION OF CO ANALYZER MODEL APMA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
SIGNAL(MAIN)	mV	4.2	4.8	Voltage of the measured CO Value
SIGNAL (COMP)	mV	0.8	0.9	Voltage of the interference component Value
CELL	°C	36.0	35.4	Ambient + (5 to 10 C)
PUMP	kpa	38.9	38.7	less than 65
AMBIENT	kpa	100.9	100.9	Atmospheric pressure
DC 24V	mV	23.9	23.9	24+/- 0.5 V
DC 5V	mV	4.9	4.9	5+/- 0.5 V

Calibrate By :

June 1, 2023

Checked By :

June 1, 2023

Calibration Data of CO Analyzer

Analyzer Performance Test

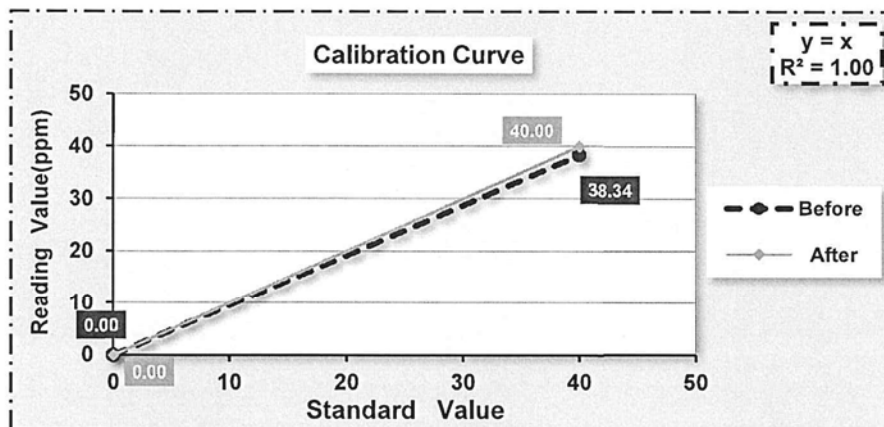
Equipment	Gas Analyzer (CO)	Customer Name	ทีแอลที คอนซัลแตนท์
Manufacture	HORIBA	Location	Envi Research
Model	APMA-370	Quotation	2023-00883
Serial No.	SFB4TS99	Calibration Date	June 1, 2023
Analyzer Unit	ppm	Time	1:19 PM

Instruments for Calibration

Instruments	Manufacture	Model	Serial Number
Zero Air Supply	Thermo Env.	111	0700419829
Dynamic Dilution Calibrator	Tanabyte	300	0165
Standard Gas Components	CO = 4,516 ppm		
Cylinder No : EB0123013	NO = 55.3 ppm		
Expire Date : Oct 22, 2027	SO ₂ = 54.9 ppm		

Single Point Calibration

Standard Gas	Standard Gas Value	Analyzer Value (ppm)		Stability		% Abs Error
		Before	After	Before	After	
Zero	0	0.00	0.00	-	-	-
Span	40	38.34	40.00	-	-	4.15



STATUS TEST AND VALIDATION OF CO ANALYZER MODEL APMA-370

Parameter	Unit	Observed Value		Nominal Range
		Before Adjust	After Adjust	
SIGNAL(MAIN)	mV	5.8	6.3	Voltage of the measured CO Value
SIGNAL (COMP)	mV	0.9	0.8	Voltage of the interference component Value
CELL	°C	37.7	37.8	Ambient + (5 to 10 C)
PUMP	kpa	39.2	39.2	less than 65
AMBIENT	kpa	101.0	101.0	Atmospheric pressure
DC 24V	mV	23.9	23.9	24+/- 0.5 V
DC 5V	mV	4.9	4.9	5+/- 0.5 V

Calibrate By :

June 1, 2023

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ENVIRONMENT RESEARCH & TECHNOLOGY CO., LTD.

Checked By :

June 1, 2023

Sound Level Meter Calibration Report

Support Equipment Type : Sound Level Calibrator

Manufacture : BSWA Technology

Model : CA111

Serial No. : 590331

Range of Calibrator

- **Sound Pressure Level** : 94.0 dB.

- **Frequency** : 1,000 Hz.

Calibrated By : Mr.Apichat Pulphon

Calibration Date : June 16, 2023

Customer Name : TLT Consultants Company Limited : โครงการทำเทียบเรือโซดชัย

[illegible]

Checked By

Technician

envi research
ENVIRONMENT RESEARCH & TECHNOLOGY CO. LTD.

Approved By

Environmental Scientist



Calibration Chart

BSWA TECH

BSWA-IV-C021-03-0048A

Sound Calibrator model CA111
Serial Number 590331
Appearance OK
Power Supply 1.5V LR6 (AA battery) x2
Sound Pressure Level 14.04 / 114.05 dB
Frequency 999.9 / 999.9 Hz
THD (@1000Hz) 0.71 / 1.33 %

Copying and using select parts, or tampering with this document without the permission of BSWA is forbidden!

BSWA Technology Ltd.

www.bswa-tech.com

This equipment was calibrated at the following ambient conditions:

Temperature: 20 °C
Humidity: 40 %RH
Pressure: 1025 hPa

This equipment is qualified!

Calibrated

2023-3-7

Date

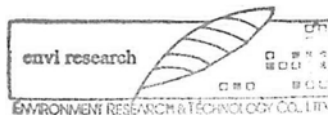
Personal Pump Calibration Report

Equipment Type	: Personal Pump
Equipment Range	: 0.005 – 5.0 L/min
Calibration Range	: 0.005 – 3.0 L/min
Calibration Type	: DryCal Bubble Type
Volume for Calibration	: 2.0 L/min
Calibrated By	: [REDACTED]
Calibration Date	: June 19, 2023
Customer Name	: TLT Consultants Company Limited : โครงการทำเทียบเรือโซคซัย

[illegible]

Checked By

Technician



Approved By

Environmental Scientist

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No.23-66/0125

MTC.No.23-66/0125

Number of page(s) 2

CALIBRATION CERTIFICATE

Nomenclature : DRYCAL DC-LITE

Manufacturer : BIOS International Corporation, U.S.A.

Serial No.: 108398

Model : DCL-ML

Scale range : 50 ml/min to 2000 ml/min

Subdivision : (0.01, 0.1, 1) ml/min

Submitted by : ENVIRONMENT RESEARCH & TECHNOLOGY CO.,LTD.

25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,

Toongsonghong, Laksi, Bangkok 10210, Thailand.

Received date : 8 December 2022 **Condition of measured item :** Normal

Calibration date : 15 December 2022

Standard :

Standard	Certificate No.	Date due	Traceability
RTD Thermometer	PSL-T 643/65	1-Jun-24	TISTR
Molbox/PressureTransducer/UpStream	MP-0013-21	25-Jan-23	NIMT
Primary Flow Calibrator S/N 117982	MW-0011-21	8-Apr-23	NIMT
Primary Flow Calibrator S/N 119521	MW-0012-21	31-Mar-23	NIMT

Calibrated by : ...

Approved by :

Director

Mechanical Engineering Standards Laboratory

Ref. 2013265120805271001

Issued Date 15 December 2022

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.

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No.23-66/0125

2/2

MTC.No.23-66/0125

Calibration point : (50, 200, 2000) ml/min

Ambient condition : Temperature (23 ± 3) °C , Relative humidity (55 ± 15) %

Atmospheric pressure (1010 ± 13) hPa

Calibration method : The flowmeter (UUC) was calibrated by comparison method with standard flowmeter according to CP-370.01.

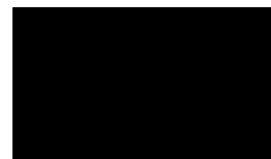
The reported value is the value that converted to value at reference condition within pressure and temperature of the actual gas entering the UUC

Measurement data :

UUC Value (ml/min)	Standard Value (ml/min)	Temperature (°C)	Pressure (hPa)	Deviation (%)	Uncertainty (%)
50.78	49.685	23.783	1012.46	+2.21	1.08
200.3	195.56	23.787	1013.15	+2.44	0.98
2017	1956.0	23.659	1022.46	+3.12	0.86

The reported expanded uncertainties are based on standard uncertainties multiplied by a coverage factor $k=2$, which provides a level of confidence of approximately 95%.

The end of calibration certificate.



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

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

FM.BL.MTC.002 Rev.4

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Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)



Cert.No.: 23MM1

Page.: 1 of 3

Certificate of Calibration

Equipment : Electronic Balance

Manufacturer : AND

Model : BM-5

Serial No. : T1004302

ID No. : ERTC-L-In.-176

Submitted by : Environment Research & Technology Company Limited.
25/114 Moo 6, Soi Chinaket 1, Ngamwongwan Road,
Toongsonghong, Laksi,
Bangkok 10210

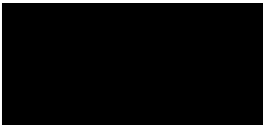
Location : ห้องปฏิบัติการวิเคราะห์ (411)

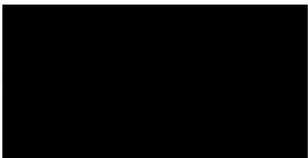
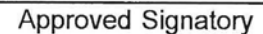
Received order : 4 January 2023

Calibration Date : 4 January 2023

Ambient Temperature : 15 °C to 40 °C

Relative Humidity : 30 % to 90 %

Calibrated by : 

Approved by : 

Approved Signatory

Issue Date : 16 January 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 0049326



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2301-0002ON-10

Cert.No.: 23MM1

Page: 2 of 3

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:-

<u>Instruments</u>	<u>Model</u>	<u>Serial No.</u>	<u>ID No.</u>	<u>Test report No.</u>	<u>Due date</u>
1) Standard Weight Set (E2)	15884	-	70RC138	MM-0009-21	03 Feb 2023

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 Internal Calibration

Range capacity : 0 g to 5.2 g Resolution 0.000001 g

Before Adjustment :

<u>Applied Weight</u>	<u>Balance Reading</u>	<u>Correction</u>	<u>Measurement Uncertainty</u>	<u>Coverage Factor</u>
(g)	(g)	(g)	(\pm mg)	(k)
2.5	2.500008	-0.000008	0.026	2.00
5	5.000007	-0.000007	0.027	2.00

After Adjustment :

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

<u>Applied Weight</u>	<u>Standard Deviation of Reading (g)</u>
(g)	
2.5	0.0000007
5	0.0000007



Equipment : Electronic Balance
 Condition As-Received : Used Item
 Reference : 2301-0002ON-10

Result of calibration

2. Effect of off center loading

A mass of 2 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)
+0.000002	+0.000005	+0.000004	+0.000002	+0.000003

3. Departure from nominal value

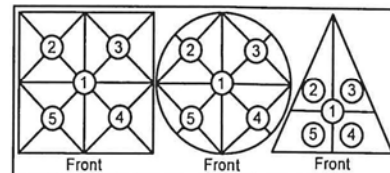
Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (\pm mg)	Coverage Factor (k)
Unload	0.000000	0.000000	0.0060	2.11
0.014	0.014002	-0.000002	0.0060	2.00
0.015	0.015001	-0.000001	0.0060	2.00
0.5	0.499995	+0.000005	0.013	2.00
1	1.000001	-0.000001	0.016	2.00
1.5	1.500001	-0.000001	0.020	2.00
2	1.999996	+0.000004	0.020	2.00
2.5	2.500001	-0.000001	0.026	2.00
3	3.000004	-0.000004	0.026	2.00
4	3.999997	+0.000003	0.027	2.00
5	5.000002	-0.000002	0.027	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-

Cert.No.: 23MM1

Page: 3 of 3



Maximum difference between
 off-center and central loading
 (g)
 0.000003



Calibration Test Report

Report No.: OP-6510001

Calibrated Date: 18 October 2022

Calibrated for: บริษัท เอ็น ไวรอนเมนต์ รีเสิร์ช แอนด์ เทคโนโลยี จำกัด จำกัด

Equipment: Opacity Meter

Manufacturer: Wager, USA

Model: 6500

Serial or ID No. 11965

Environment: Temperature 33.0 °C

Humidity: 46 %RH

Reference Standards: Neutral Density Calibration Filter Standard

Result of Calibration

Reference Standard (% Opacity)	INSTRUMENT READING (% Opacity)	ERROR (% Opacity)	ADJUST
0	0	-	-
50.0	50.2	0.2	50.0
100	100	-	-

Calibrated By:

Date 18 / 10 / 22

Approve By:

Date 18 / 10 / 22