

ภาคผนวกที่ 4

ใบรับรองการสอบเทียบเครื่องมือ



บริษัท แอ็นเดอร์ส อินสตรูเม้นท์ จำกัด
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Tel: 0 2920 1458-9 Fax: 0 2920 1460 Email : met_jit@ahos.com

TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

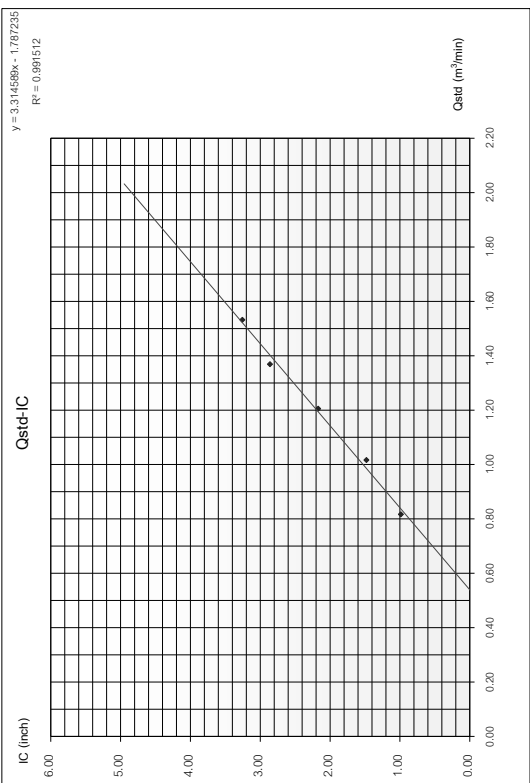
Sampler Location		Date	
สำนักงานสิ่งแวดล้อมภาคที่ 11		Start Time	March 9, 2025
Sampler Number	TSP No.5	Stop Time	10:51 AM
Meter Serial Number	BL-05	Person	
Recorder Serial Number	-		1

Plate No.	(Delta H)	(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop
Pressure Drop Across Orifice (in H ₂ O)		$(\Delta H)(OPaP_{atm})T_{ref}/T_{atm}$		Qstd = (1 in ³)(A-b)		Qstd = ((PaP _{atm})(T _{ref} /T _{atm})) ^{0.5}		Pressure	
Positive		Negative		Positive		Negative		K = C*(273)	
5	1.3	2.6	1.90099	0.81983	1.0	0.99	305.0	757.0	
7	2.0	2.0	1.97901	1.01964	1.5	1.48	305.0	757.0	
10	2.8	2.8	2.34490	1.26565	2.2	2.17	305.0	757.0	
13	3.6	3.6	2.64707	1.36691	2.9	2.86	305.0	757.0	
18	4.5	4.5	2.95982	1.53220	3.3	3.26	305.0	757.0	
Linear Regression Y=mx + b		1.91545		Linear Equation		305.0		757.0	

1	Slope (m)	1.91545	Linear Equation						
2	Intercept (b)	0.02773	Set Point Flow Rate (X) (m ³ /min)	1.133	r	0.9970737	r ²	0.994152	Passing
3	Correlation Coefficient (r)	0.99735	Final Set Flow Rate = (I)	0	(PaP _{atm})(T _{ref} /T _{atm})	0.973162407	C = (PaP _{atm})(T _{ref} /T _{atm}) ^{0.5}	0.006505148	
Result									

COMMENT

Andersen Instruments, Inc.



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PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

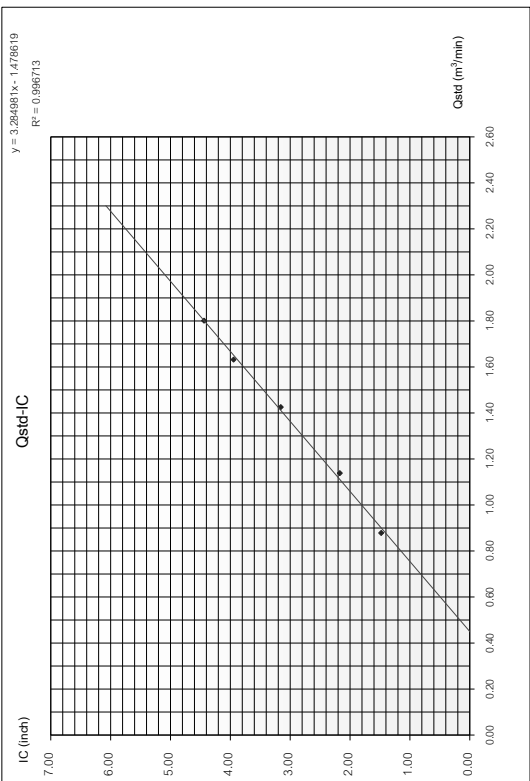
Sampler Location		Date	
สำนักงานสิ่งแวดล้อมภาคที่ 11		Start Time	March 9, 2025
Sampler Number	PM10 No.5	Stop Time	5:50 PM
Meter Serial Number	HYL-05	Person	
Recorder Serial Number	-		1

Plate No.	(Delta H)	(A)	(X)	(I)	(Y)	Temperature	Barometric	Start	Stop
Pressure Drop Across Orifice (in H ₂ O)		$(\Delta H)(OPaP_{atm})T_{ref}/T_{atm}$		Qstd = (1 in ³)(A-b)		Qstd = ((PaP _{atm})(T _{ref} /T _{atm})) ^{0.5}		Pressure	
Positive		Negative		Positive		Negative		K = C*(273)	
5	1.5	1.5	3.0	1.70068	0.87849	1.5	1.48	305.0	757.0
7	2.5	2.5	5.0	2.20589	1.13834	2.2	2.17	305.0	757.0
10	3.9	3.9	7.8	2.75546	1.42549	3.2	3.86	305.0	757.0
13	5.1	5.1	10.2	3.15564	1.63209	4.0	3.86	305.0	757.0
18	6.2	6.2	12.4	3.47384	1.80099	4.5	4.44	305.0	757.0
Linear Regression Y=mx + b		1.91545		Linear Equation		305.0		757.0	

1	Slope (m)	1.91545	Linear Equation						
2	Intercept (b)	0.02773	Set Point Flow Rate (X) (m ³ /min)	1.133	r	0.9968728	r ²	0.99734	Passing
3	Correlation Coefficient (r)	0.99735	Final Set Flow Rate = (I)	0	(PaP _{atm})(T _{ref} /T _{atm})	0.973162407	C = (PaP _{atm})(T _{ref} /T _{atm}) ^{0.5}	0.006505148	
Result									

COMMENT

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TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

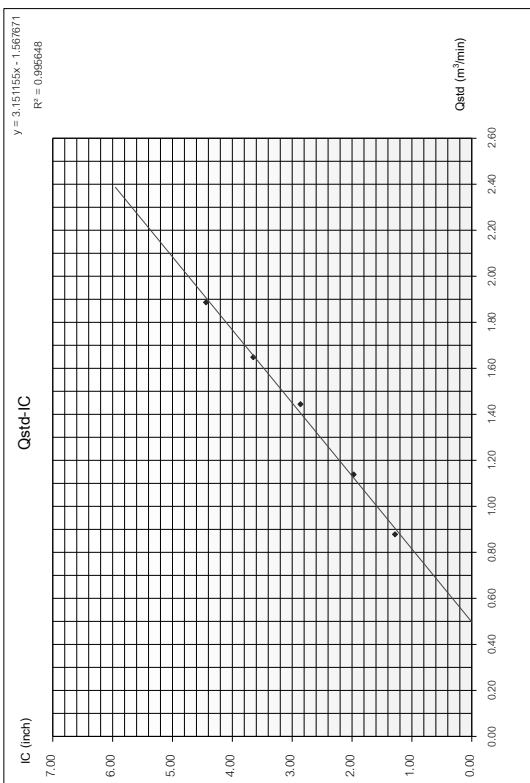
Sampler Location		Date	
บ้านใหม่พัฒนา อ.บ้านใหม่		Start Time	March 9, 2025
Sampler Number	TSP No.8	Stop Time	10:10 AM
Meter Serial Number	BL-08	Person	[Redacted]
Recorder Serial Number	-		

Paile No.	(Delta H) Pressure Drop Across Orifice (in H ₂ O)	(A) $[\Delta H \cdot O/Pa \cdot P_{atm} \cdot T_{ref}/T_{air}]^{0.5}$	(X) $Q_{std} = (1 \text{ in}) [(A \cdot C)]$ (in ³ /min)	(I) Sample Flow Rate Indicator (inches)	(Y) $C = [(Pa \cdot P_{atm})/T_{ref}/T_{air}]^{0.5}$	Temperature (mmHg)	Barometric Pressure (mmHg)	Start Meter	Stop Meter
5	1.5	1.5	3.0	1.70968	1.3	1.28	305.0	757.0	
7	2.5	2.5	5.0	2.201589	1.3834	1.97	305.0	757.0	
10	4.0	4.0	8.0	2.79026	1.44374	2.86	305.0	757.0	
13	5.2	5.2	10.4	3.18138	1.64615	3.65	305.0	757.0	
18	6.8	6.8	13.6	3.63805	1.88881	4.44	305.0	757.0	
Linear Regression Y=CNX, Y=mx+b						Average	305.0	757.0	

1	Slope (m)	1.91345	Linear Equation			r ²	0.97952	Passing	760.0
2	Intercept (b)	0.02773	Set Point Flow Rate (X) (m ³ /min)	1.133	r	0.9893533		Fun	298.0
3	Correlation Coefficient (r)	0.99035	Final Set Flow Rate = (I)	0	(Pa/Pa _{atm})/T _{ref} /T _{air}		0.975162407		
Result					C= (Pa/Pa _{atm})/T _{ref} /T _{air} m ³ /0.5		0.006505148		

COMMENT

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PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

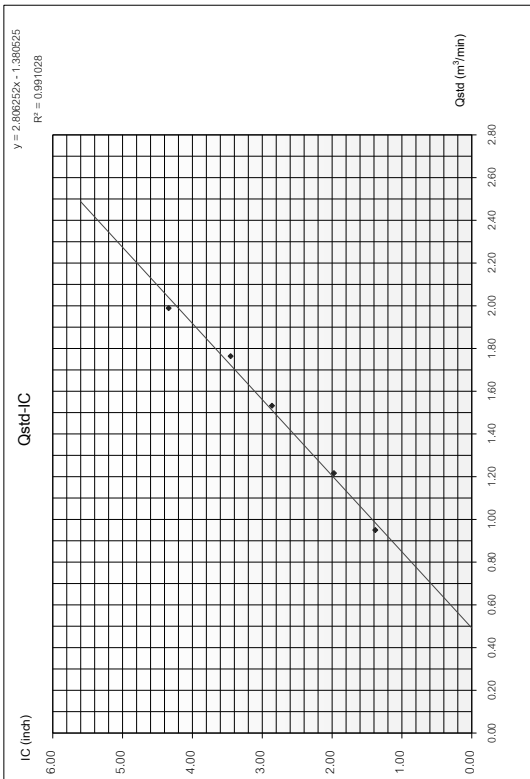
Sampler Location		Date	
บ้านใหม่พัฒนา อ.บ้านใหม่		Start Time	March 9, 2025
Sampler Number	PM10 No.10	Stop Time	2:30 PM
Meter Serial Number	HYL-10	Person	TE-5025A
Recorder Serial Number	-	Calibrator Serial Number	1

Paile No.	(Delta H) Pressure Drop Across Orifice (in H ₂ O)	(A) $[\Delta H \cdot O/Pa \cdot P_{atm} \cdot T_{ref}/T_{air}]^{0.5}$	(X) $Q_{std} = (1 \text{ in}) [(A \cdot C)]$ (in ³ /min)	(I) Sample Flow Rate Indicator (inches)	(Y) $C = [(Pa \cdot P_{atm})/T_{ref}/T_{air}]^{0.5}$	Temperature (mmHg)	Barometric Pressure (mmHg)	Start Meter	Stop Meter
5	1.7	1.8	3.5	1.94598	1.4	1.36	305.0	757.0	
7	2.8	2.9	5.7	2.95025	1.71440	1.97	305.0	757.0	
10	4.5	4.5	9.0	2.99892	1.83220	2.86	305.0	757.0	
13	5.9	6.0	11.9	3.40009	1.76402	3.45	305.0	757.0	
18	7.5	7.6	15.1	3.83343	1.98892	4.4	305.0	757.0	
Linear Regression Y=CNX, Y=mx+b						Average	305.0	757.0	

1	Slope (m)	1.91345	Linear Equation			r ²	0.98533	Passing	760.0
2	Intercept (b)	0.02773	Set Point Flow Rate (X) (m ³ /min)	1.133	r	0.996674		Fun	298.0
3	Correlation Coefficient (r)	0.99035	Final Set Flow Rate = (I)	0	(Pa/Pa _{atm})/T _{ref} /T _{air}		0.975162407		
Result					C= (Pa/Pa _{atm})/T _{ref} /T _{air} m ³ /0.5		0.006505148		

COMMENT

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TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

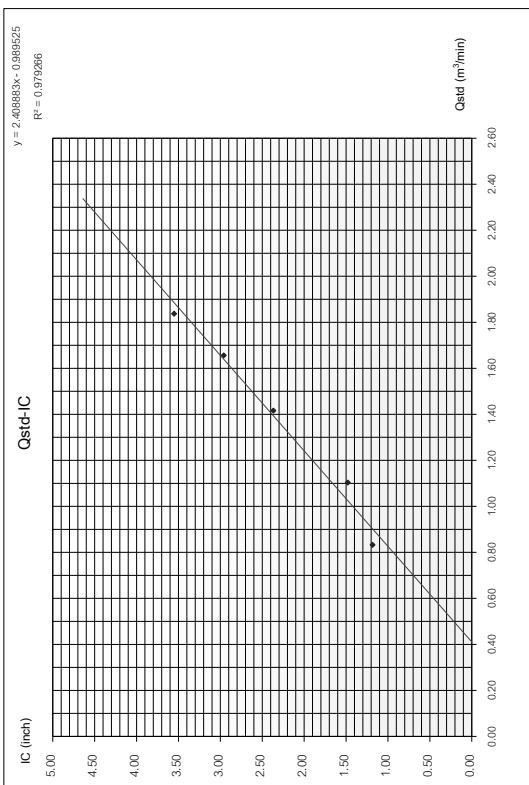
Sampler Location		Date	
กรุงเทพมหานคร/บางกะปิ		Start Time	March 9, 2025
Sampler Number	TSP No.14	Stop Time	10:25 AM
Motor Serial Number	BL-14	Person	1
Recorder Serial Number	-	Calibrator Serial Number	

Paile No.	(Delta H)	(A)	(X)	(I)	(Y)	Temperature	Start	Stop
Pressure Drop Across Orifice (in.H ₂ O)		$\Delta H \cdot O/Pa \cdot P_{atm} / T_{ref}$		Sample Flow Rate Indicator IC = $(P/P_{atm}) \cdot T_{ref} / T_{air}$		Pressure	Meter	Meter
Positive		$\Delta H \cdot O$		(in.H ₂ O)		(K = C+273)		
5	1.3	1.4	2.7	1.02099	1.18	305.0	757.0	
7	2.3	2.4	4.7	2.13969	1.48	305.0	757.0	
10	3.8	3.9	7.7	2.73444	2.37	305.0	757.0	
13	5.2	5.3	10.5	3.19664	2.86	305.0	757.0	
18	6.4	6.5	12.9	3.54319	3.55	305.0	757.0	
Linear Regression Y=mx + b		1.91345		Linear Equation		Average	305.0	

1	Slope (m)	1.91345	Linear Equation	760.0
2	Intercept (b)	0.02773	Set Point Flow Rate (X) (m ³ /min)	298.0
3	Correlation Coefficient (r)	0.99939	Final Set Flow Rate = (I)	0.975162407
Result		C=(P/P _{atm})/T _{air} T _{ref} m ³ /0.5		0.006505148

COMMENT

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PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

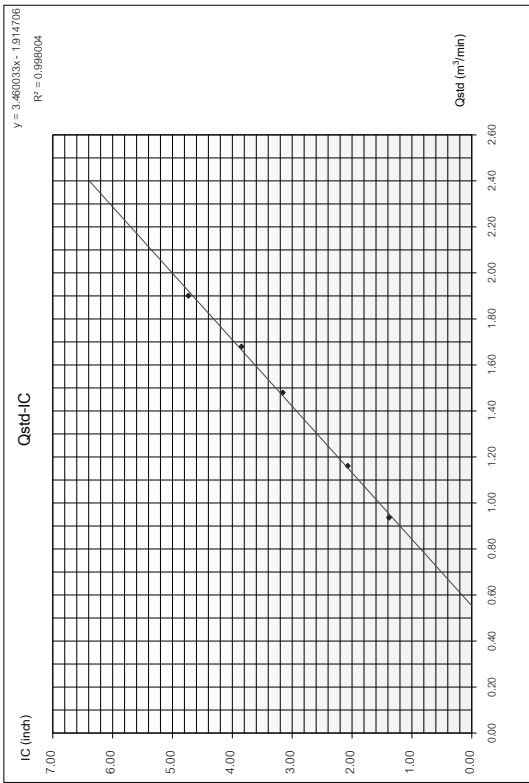
Sampler Location		Date	
กรุงเทพมหานคร/บางกะปิ		Start Time	March 9, 2025
Sampler Number	PM-10 No.12	Stop Time	2:45 PM
Motor Serial Number	HY-12	Person	1
Recorder Serial Number	-	Calibrator Serial Number	

Paile No.	(Delta H)	(A)	(X)	(I)	(Y)	Temperature	Start	Stop
Pressure Drop Across Orifice (in.H ₂ O)		$\Delta H \cdot O/Pa \cdot P_{atm} / T_{ref}$		Sample Flow Rate Indicator IC = $(P/P_{atm}) \cdot T_{ref} / T_{air}$		Pressure	Meter	Meter
Positive		$\Delta H \cdot O$		(in.H ₂ O)		(K = C+273)		
5	1.7	1.7	3.4	1.91903	1.36	305.0	757.0	
7	2.6	2.6	5.2	2.94968	2.07	305.0	757.0	
10	4.2	4.2	8.4	2.89946	3.46	305.0	757.0	
13	5.4	5.4	10.8	3.24199	3.85	305.0	757.0	
18	6.9	6.9	13.8	3.69470	4.74	305.0	757.0	
Linear Regression Y=mx + b		1.91345		Linear Equation		Average	305.0	

1	Slope (m)	1.91345	Linear Equation	760.0
2	Intercept (b)	0.02773	Set Point Flow Rate (X) (m ³ /min)	298.0
3	Correlation Coefficient (r)	0.99939	Final Set Flow Rate = (I)	0.975162407
Result		C=(P/P _{atm})/T _{air} T _{ref} m ³ /0.5		0.006505148

COMMENT

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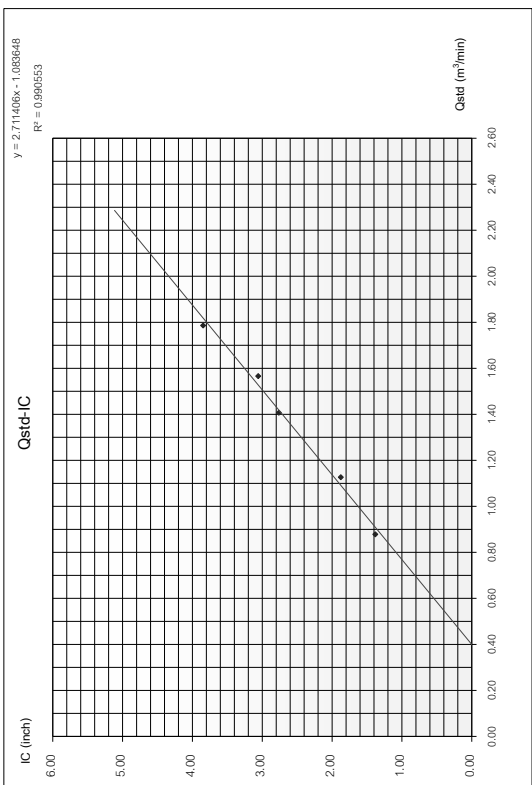
TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location		Date	
พื้นที่วัดมลพิษทางอากาศบริเวณวัด		Start Time	March 9, 2025
Sampler Number	TSP No.1	Stop Time	9:05 AM
Meter Serial Number	BL-01	Person	[REDACTED]
Recorder Serial Number	-		

Paile No.	(Delta H)	(A)	(X)	(t)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
Pressure Drop Across Orifice (in H ₂ O)		$(\Delta H)(OP/P_{atm})T_{ref}/T_{air}$		Qstd = (1 in ³)(A)(t)		IC = ((P/P _{atm})(T _{ref} /T _{air})) ^{0.5}			
Positive		Negative		Positive		Negative			
Delta Q		Delta Q		Delta Q		Delta Q			
5	1.5	1.5	3.0	1.70968	0.87949	1.2676	1.9	305.0	757.0
7	2.4	2.5	4.9	2.18372	1.2676	1.87	305.0	757.0	
10	3.8	3.8	7.6	2.71981	1.48882	2.76	305.0	757.0	
13	4.7	4.7	9.4	3.02457	1.56620	3.1	305.0	757.0	
18	6.1	6.1	12.2	3.44571	1.78629	3.9	305.0	757.0	
Linear Regression Y=mx + b		Average		Average		Average			
1. Slope (m)		1.91545		Linear Equation		r ²		0.99231	
2. Intercept (b)		0.02773		Set Point Flow Rate (X) (m ³ /min)		1.133		r	
3. Correlation Coefficient (r)		0.99038		Final Set Flow Rate = (I)		0		(P/P _{atm})(T _{ref} /T _{air})	
Result								0.973162407	
								0.006505148	

COMMENT

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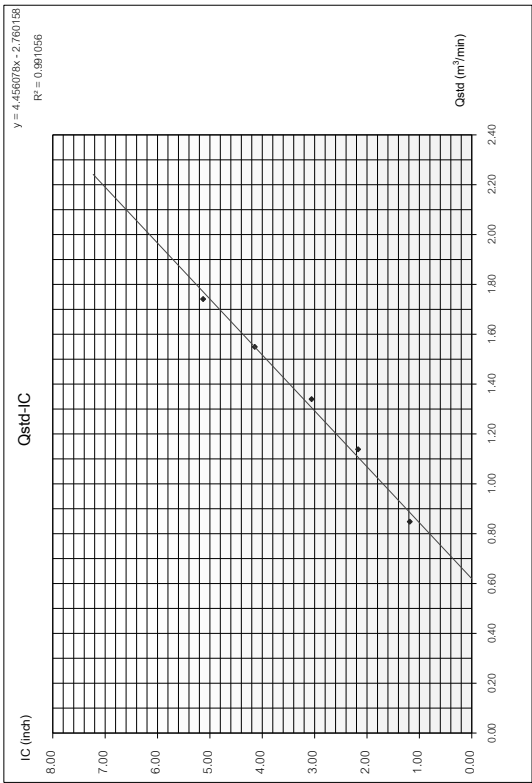
PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sampler Location		Date	
พื้นที่วัดมลพิษทางอากาศบริเวณวัด		Start Time	March 9, 2025
Sampler Number	PM10 No.1	Stop Time	5:20 PM
Meter Serial Number	HY-C01	Person	[REDACTED]
Recorder Serial Number	-		

Paile No.	(Delta H)	(A)	(X)	(t)	(Y)	Temperature	Barometric Pressure	Start Meter	Stop Meter
Pressure Drop Across Orifice (in H ₂ O)		$(\Delta H)(OP/P_{atm})T_{ref}/T_{air}$		Qstd = (1 in ³)(A)(t)		IC = ((P/P _{atm})(T _{ref} /T _{air})) ^{0.5}			
Positive		Negative		Positive		Negative			
Delta Q		Delta Q		Delta Q		Delta Q			
5	1.4	1.4	2.8	1.06074	0.84821	1.2	305.0	757.0	
7	2.5	2.5	5.0	2.00589	1.13834	2.2	305.0	757.0	
10	3.4	3.5	6.9	2.89134	1.38978	3.1	305.0	757.0	
13	4.6	4.6	9.2	2.80222	1.54929	4.2	305.0	757.0	
18	5.8	5.8	11.6	3.35992	1.74145	5.2	305.0	757.0	
Linear Regression Y=mx + b		Average		Average		Average			
1. Slope (m)		1.91545		Linear Equation		r ²		0.98774	
2. Intercept (b)		0.02773		Set Point Flow Rate (X) (m ³ /min)		1.133		r	
3. Correlation Coefficient (r)		0.99038		Final Set Flow Rate = (I)		0		(P/P _{atm})(T _{ref} /T _{air})	
Result								0.973162407	
								0.006505148	

COMMENT

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TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

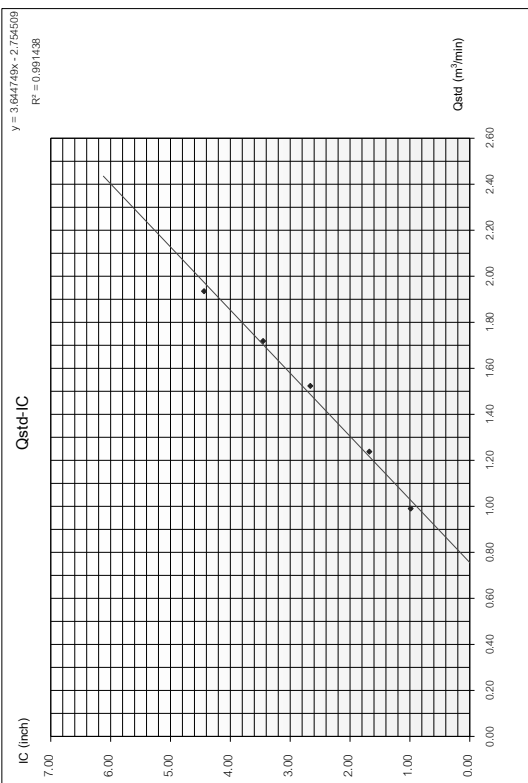
Sampler Location		Date	
บ้านวังช้างชุมพล		Start Time	March 9, 2025
Sampler Number	TSP No.18	Stop Time	11:45 AM
Motor Serial Number	BL-18	Person	1
Recorder Serial Number	-		

Point No.	(Delta H) Pressure Drop Across Orifice (in.H ₂ O)	(A) $[\Delta H \cdot O / P_a P_a] T_a / T_o$	(X) Qstd = (1 in.) [(A-b)] (in ³ /min)	(t) Sample Flow Rate Indicator (inches)	(Y) IC = [(Pa-Pa _{at})] T _a / T _o	Temperature Pressure (K = C+273) (mmHg.)	Start Meter
5	1.9	3.8	1.92305	1.0	0.99	305.0	757.0
7	2.9	3.0	2.90221	1.7	1.68	305.0	757.0
10	4.4	4.5	4.42589	2.7	2.86	305.0	757.0
13	5.6	5.7	5.61618	3.5	3.45	305.0	757.0
18	7.1	7.2	7.143	4.5	4.44	305.0	757.0
Linear Regression Y=mx+b						Average	757.0

1	Slope (m)	1.91345	Linear Equation	r ²	0.99102	Passing	760.0
2	Intercept (b)	0.02773	Set Point Flow Rate (X) (m ³ /min)	1.133	t	0.9643796	298.0
3	Correlation Coefficient (r)	0.99939	Final Set Flow Rate = (1)	0	(Pa-Pa _{at}) / T _a / T _o	0.973162407	
Result		C= (Pa-Pa _{at}) / T _a / T _o		0.986505148			

COMMENT

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PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

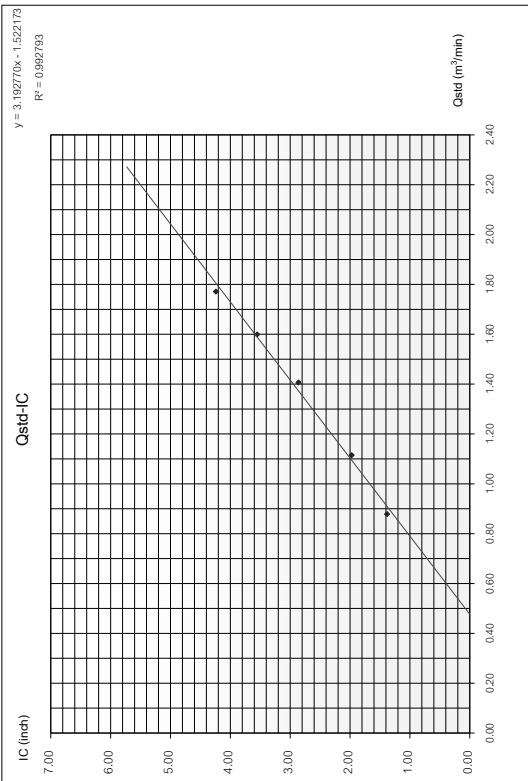
Sampler Location		Date	
บ้านวังช้างชุมพล		Start Time	March 9, 2025
Sampler Number	PM-10 No.14	Stop Time	3:10 PM
Motor Serial Number	110-L14	Person	1
Recorder Serial Number	-		

Point No.	(Delta H) Pressure Drop Across Orifice (in.H ₂ O)	(A) $[\Delta H \cdot O / P_a P_a] T_a / T_o$	(X) Qstd = (1 in.) [(A-b)] (in ³ /min)	(t) Sample Flow Rate Indicator (inches)	(Y) IC = [(Pa-Pa _{at})] T _a / T _o	Temperature Pressure (K = C+273) (mmHg.)	Start Meter
5	1.5	3.0	1.70068	1.4	1.36	305.0	757.0
7	2.4	2.4	2.40132	2.0	1.97	305.0	757.0
10	3.8	3.8	3.79891	2.8	2.86	305.0	757.0
13	4.9	4.9	4.90448	3.6	3.55	305.0	757.0
18	6.0	6.0	6.01147	4.3	4.24	305.0	757.0
Linear Regression Y=mx+b						Average	757.0

1	Slope (m)	1.91345	Linear Equation	r ²	0.99754	Passing	760.0
2	Intercept (b)	0.02773	Set Point Flow Rate (X) (m ³ /min)	1.133	t	0.9986728	298.0
3	Correlation Coefficient (r)	0.99939	Final Set Flow Rate = (1)	0	(Pa-Pa _{at}) / T _a / T _o	0.973162407	
Result		C= (Pa-Pa _{at}) / T _a / T _o		0.986505148			

COMMENT

Andersen Instruments, Inc.



Calibrated By

Approved By



บริษัท เอ็นไอร์ เซอร์วิส จำกัด

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นไอร์ เซอร์วิส จำกัด 42 รามอินทรา 14 แยก 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201
ENVIAIR SERVICE CO.,LTD.

Analyzer Performance Test

Calibrated Date: 9 MARCH 2025

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer	Manufacturer: Thermo Environmental
Model: 42C	S/N: 72706374

Calibration System

Dilutor Model Deshi Model 5008	Standard Gas			
	NO Conc	SO ₂ Conc	CO Conc	PPM
S/N: 705	46.05	46.01	4.487	PPM
ZERO AIR Generator API Model 701	CO Conc	4.487	PPM	
Cylinder number CC507080	CO Conc	4.487	PPM	
S/N: 1924	CO Conc	4.487	PPM	
Expire Date: 23 Jul. 2025	CO Conc	4.487	PPM	

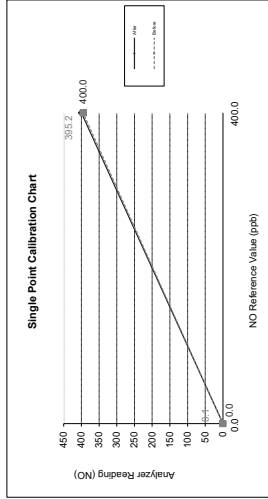
Environment: Temperature _25.5_ °C Humidity_ 51 _ %RH

Calibration Check (Before adjust)

GAS	Zero				Span	
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	395.2	400.0	-1.2
NO _x	0.1	0.0	0.1	400.0	400.0	0.0

Calibration Check (After adjust)

GAS	Zero				Span	
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NO _x	0.0	0.0	0.0	400.0	400.0	0.0



บริษัท เอ็นไอร์ เซอร์วิส จำกัด

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นไอร์ เซอร์วิส จำกัด 42 รามอินทรา 14 แยก 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201
ENVIAIR SERVICE CO.,LTD.

Analyzer Performance Test

Calibrated Date: 9 MARCH 2025

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer	Manufacturer: ECO TECH
Model: 40	S/N: E020040

Calibration System

Dilutor Model Deshi Model 5008	Standard Gas			
	NO Conc	SO ₂ Conc	CO Conc	PPM
S/N: 705	55.17	55.11	4.535	PPM
ZERO AIR Generator API Model 701	CO Conc	4.535	PPM	
Cylinder number EB0129027	CO Conc	4.535	PPM	
S/N: 1924	CO Conc	4.535	PPM	
Expire Date: 29 Oct. 2027	CO Conc	4.535	PPM	

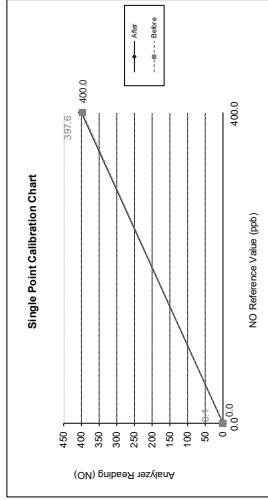
Environment: Temperature _25.5_ °C Humidity_ 51 _ %RH

Calibration Check (Before adjust)

GAS	Zero				Span	
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	397.6	400.0	-0.6
NO _x	0.1	0.0	0.1	400.0	400.0	0.0

Calibration Check (After adjust)

GAS	Zero				Span	
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NO _x	0.0	0.0	0.0	400.0	400.0	0.0





บริษัท เอ็นไอร์ เซอร์วิส จำกัด

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นไอร์ เซอร์วิส จำกัด 42 รามอินทรา 14 แยก 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201
ENVIAIR SERVICE CO.,LTD.

Analyzer Performance Test

Calibrated Date: 9 MARCH 2025

Instruments Information

Analyzer Type: NONOX/NOx Analyzer	Manufacturer: Thermo Environmental
Model: 42C	S/N: 72706371

Calibration System

Dilutor Model ZERO AIR Generator API Model 701	Calibrator Unit Deshi Model 5008 S/N: 705	Standard Gas		
		NO Conc	SO2 Conc	CO Conc
		55.17 PPM	55.11 PPM	4.535 PPM
Cylinder number EB0129027		Expire Date: 29 Oct. 2027		
S/N: 1924				

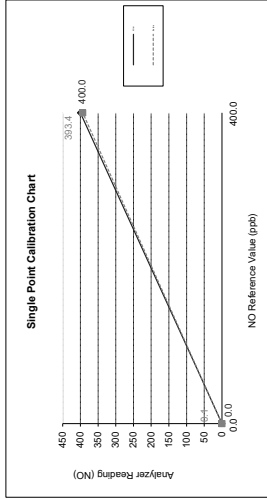
Environment: Temperature _ 25.5 _ °C Humidity_ 51 _ %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	383.4	400.0	-1.7
NOx	0.1	0.0	0.1	396.7	400.0	-0.8

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NOx	0.0	0.0	0.0	400.0	400.0	0.0



บริษัท เอ็นไอร์ เซอร์วิส จำกัด

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นไอร์ เซอร์วิส จำกัด 42 รามอินทรา 14 แยก 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201
ENVIAIR SERVICE CO.,LTD.

Analyzer Performance Test

Calibrated Date: 9 MARCH 2025

Instruments Information

Analyzer Type: NONOX/NOx Analyzer	Manufacturer: Thermo Environmental
Model: 42C	S/N: 601114773

Calibration System

Dilutor Model ZERO AIR Generator API Model 701	Calibrator Unit Deshi Model 5008 S/N: 705	Standard Gas		
		NO Conc	SO2 Conc	CO Conc
		55.17 PPM	55.11 PPM	4.535 PPM
Cylinder number EB0129027		Expire Date: 29 Oct. 2027		
S/N: 1924				

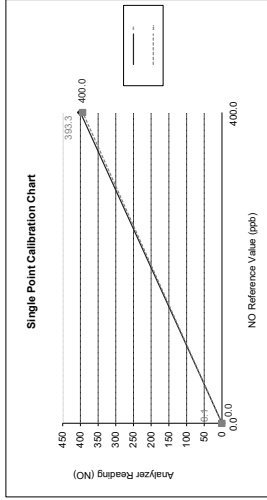
Environment: Temperature _ 25.5 _ °C Humidity_ 51 _ %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	383.3	400.0	-1.7
NOx	0.1	0.0	0.1	396.4	400.0	-0.9

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NOx	0.0	0.0	0.0	400.0	400.0	0.0





บริษัท เอ็นวิร์ เซอร์วิส จำกัด

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นวิร์ เซอร์วิส จำกัด 42 Ramindha 14 yaek 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201
ENVIAIR SERVICE CO.,LTD.

Analyzer Performance Test

Calibrated Date: 9 MARCH 2025

Instruments Information

Analyzer Type: NO/NO ₂ /NOx Analyzer	Manufacturer: Thermo Environmental
Model: 42C	SIN: 601114763

Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008	NO Conc 55.47 PPM
SIN: 705	SO ₂ Conc 55.11 PPM
ZERO AIR Generator API Model 701	CO Conc 4.535 PPM
SIN: 1924	Cylinder number EB0129027
Expire Date: 29 Oct. 2027	

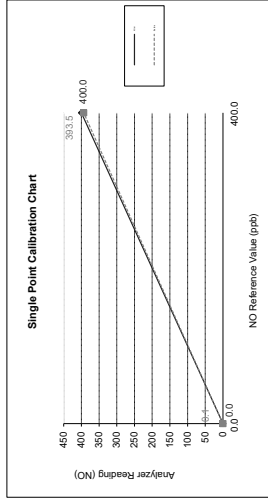
Environment: Temperature _25.5_ °C Humidity: _51_ %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	393.5	400.0	-1.6
NOx	0.1	0.0	0.1	396.2	400.0	-1.0

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NOx	0.0	0.0	0.0	400.0	400.0	0.0



บริษัท เอ็นวิร์ เซอร์วิส จำกัด

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นวิร์ เซอร์วิส จำกัด 42 Ramindha 14 yaek 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201
ENVIAIR SERVICE CO.,LTD.

Analyzer Performance Test

Calibrated Date: 9 MARCH 2025

Instruments Information

Analyzer Type: SO ₂ Analyzer	Manufacturer: Thermo Environmental
Model: 43C	SIN: 335003719

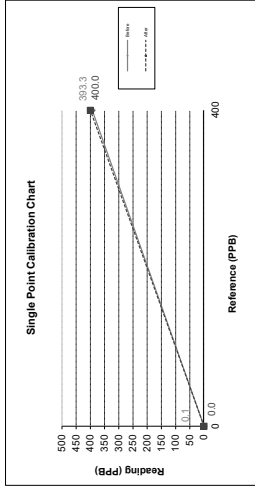
Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008	NO Conc 55.47 PPM
SIN: 705	SO ₂ Conc 55.11 PPM
ZERO AIR Generator API Model 701	CO Conc 4.535 PPM
SIN: 1924	Cylinder number EB0129027
Expire Date: 29 Oct. 2027	

Environment: Temperature _25.5_ °C Humidity: _51_ %RH

Calibration Report

Status	Zero			Span		
Before After	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
	0.0	0.1	0.1	400.0	393.3	-1.7
	0.0	0.0	0.0	400.0	400.0	0.0





บริษัท เอ็นวีอาร์ เซอร์วิส จำกัด

42 ถนนมิตรภาพ 14 แขวง 9 เขตราชเทวี กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นวีอาร์ เซอร์วิส จำกัด 42 Ramithra 14 yak 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 9 MARCH 2025

Instruments Information

Analyzer Type: SO2 Analyzer Model: 43C	Manufacturer Thermo Environmental S/N: 71354368
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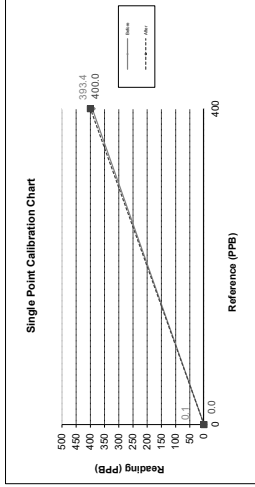
Calibration System

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	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	0.1	0.1	400.0	393.4	-1.7
After	0.0	0.0	0.0	400.0	400.0	0.0



C



บริษัท เอ็นวีอาร์ เซอร์วิส จำกัด

42 ถนนมิตรภาพ 14 แขวง 9 เขตราชเทวี กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นวีอาร์ เซอร์วิส จำกัด 42 Ramithra 14 yak 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 9 MARCH 2025

Instruments Information

Analyzer Type: SO2 Analyzer Model: 50	Manufacturer ECOTECH S/N: E020050
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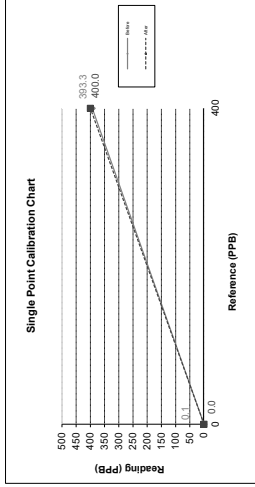
Calibration System

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	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	0.0	0.1	400.0	393.3	-1.7
After	0.0	0.0	0.0	400.0	400.0	0.0



Ca



บริษัท เอ็นวีเออร์ เซอร์วิส จำกัด

42 ถนนมิตรภาพ 14 แขวง 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นวีเออร์ เซอร์วิส จำกัด 42 Ramithra 14 yak 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 9 MARCH 2025

Instruments Information

Analyzer Type: SO2 Analyzer Model: 100A	Manufacturer API SIN: 193
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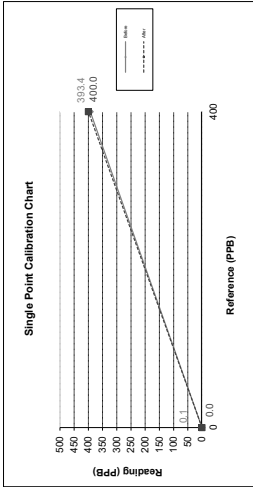
Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 SIN: 705 ZERO AIR Generator API MODEL 701 SIN: 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	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	0.1	0.1	400.0	393.4	-1.7
After	0.0	0.0	0.0	400.0	400.0	0.0



บริษัท เอ็นวีเออร์ เซอร์วิส จำกัด

42 ถนนมิตรภาพ 14 แขวง 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
บริษัท เอ็นวีเออร์ เซอร์วิส จำกัด 42 Ramithra 14 yak 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 9 MARCH 2025

Instruments Information

Analyzer Type: SO2 Analyzer Model: 100A	Manufacturer API SIN: 196
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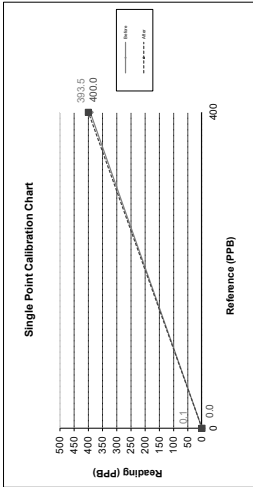
Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 SIN: 705 ZERO AIR Generator API MODEL 701 SIN: 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	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	0.1	0.1	400.0	393.5	-1.6
After	0.0	0.0	0.0	400.0	400.0	0.0





ENVIR SERVICE CO., LTD.
42 Ramnitra 14 Yeak 9, Tha Raeng, Bang Khen, Bangkok 10230
Tel. 02-9435814-5 Fax. 02-9438201 www.envirservice.co.th

Calibration Test

Certificate No. 024/24

Calibrated Date: 9/3/2025

Instruments Information

Manufacturer : YOUNG Instrument Type : four blade helicoid propeller
Model : 40C Serial Number : Logger 309018964

Environment : Temperature 25.5 °C Humidity: 51 %RH

NATIONAL STANDARD WIND TUNNEL
: Thermal Anemometer 642 S/N 91563
: Wind Aloft Plotting Board
N.I.S.T. Test Reference Number 731/241460
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586) JAPAN QUALITY ASSURANCE ORGANIZATION

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO 1425			TESTED ANEMOMETER		
	Pressure Inches	Vacuum Inches	Pressure hPa	Correction hPa	Velocity m/sec	Correction m/sec
1.00	-	-	-	-	0.9	0.10
3.02	-	-	-	-	2.8	0.22
5.04	-	-	-	-	4.9	0.14
7.03	-	-	-	-	6.8	0.23
9.01	-	-	-	-	8.8	0.21
11.03	-	-	-	-	10.7	0.33
13.01	-	-	-	-	12.6	0.41
15.03	-	-	-	-	14.4	0.63
17.05	-	-	-	-	16.5	0.55
20.02	-	-	-	-	19.4	0.62

Wind Aloft Plotting Board U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU			
WIND DIRECTION	TESTED WIND DIRECTION		Result
	Deviation		
0	0	0	Pass
90	90	0	Pass
180	180	0	Pass
270	270	0	Pass

Calibrate By :



Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 11 March, 2024

Certification No. 111/24

Page : 1 of 2

Object : Weather Station

Manufacturer : Davis Instruments

Type : Weather Monitor III

Serial No. : WC10912A21

Customer : M E T Company Limited.

36/659 Moo 6 Bangrak Phithana,
Bang Bua Thong, Nonthaburi 11110.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1011.6 hPa

NATIONAL STANDARD WIND TUNNEL :

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119
: HOOK GAGE NO 1425 Pilot Tube Theodor Friedrichs Type 0800.0000 serial 9023
N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 20 - 30 m/sec



The Result of Calibration

Certification No. 111/24

11 March, 2024

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425		TESTED ANEMOMETER	
	Pressure Inches H2O	Vacuum Inches H2O	Velocity m/sec	Correction m/sec
1.00	-	-	0.9	0.10
3.02	-	-	2.7	0.32
5.00	-	-	4.9	0.10
7.00	-	-	6.7	0.30
9.02	-	-	8.9	0.12
11.01	-	-	10.9	0.11
13.01	-	-	13.0	0.01
15.01	-	-	14.9	0.11
17.02	-	-	17.0	0.02
20.02	-	-	20.0	0.02

Wind Aloft Plotting Board.	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270



Certificate of Calibration

Certificate No. : 67-200293-1

Page : 1 of 2

Submitted by :

M E T Company Limited

36/659 Moo 6, T. Bangrakpattana, A. Bangbuatong, Nonthaburi 11110

Equipment :

Electronic Balance

Manufacturer : Sartorius

Model : BSA224S-CW

Serial No. : 35090472

ID No. : MET-EB 02/60

Capacity : 220 g

Resolution : 0.0001 g

Environment :

On site calibration was carried out at the Laboratory, M E T Company Limited

Ambient Temperature : (25.9 to 26.2) °C

Relative Humidity : (32.6 to 45.5) %

Air Pressure : 1007.0 mbar

Date of Received :

20 August 2024

Date of Calibration :

20 August 2024

Date of Issue :

21 August 2024

Calibrated by :

Akaradath Thippichai

Calibration Method :

In-house method CAL-M2001 based on UKAS Publication ref : LAB 14

Edition 7 - November 2022

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Weights

ID No.

Cert. No.

Due Date

Traceability

E261-E2624

C022220888

08 Nov 2024

National Institute of Metrology (Thailand), (NIMT)

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 67-200293-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty ± (g)
0.05	0.0001	0.00012
0.1	0.0001	0.00012
0.5	0.0001	0.00013
1	0.0000	0.00013
5	0.0000	0.00013
10	0.0000	0.00013
50	0.0001	0.00015
100	0.0000	0.00020
150	0.0000	0.00038
200	0.0001	0.00038

This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.06$, providing a level of confidence of approximately 95%

Eccentric error

Load test : 50 g

A

B

C

D

E

g



Repeatability

Load test : 200 g

Sidev.

: 0.00005 g

- o o -





Certificate of Calibration

Certificate No. : 67-400505-2

Page : 1 of 2

Submitted by :

M E T Company Limited

Equipment :

Temperature controlled enclosure (Oven)

Manufacturer : Binder

Model : ED53

Range : N/A °C

Resolution : 1 °C

Serial No. : 13-07419

ID No. : MET-OV02/57

Environment :

On site calibration was carried out at the Laboratory, M E T Company Limited

Ambient Temperature : (30.0 to 31.0) °C

Relative Humidity : (50 to 55) %

Line Voltage : (210.0 to 210.8) V

Date of Received : 20 August 2024

Date of Calibration : 20 August 2024

Date of Issue : 21 August 2024

Calibrated by : Pempon Chianpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Digital Thermometer with Thermocouple probe

ID No. Cert.No.

Due Date

Traceability

400029 & 400030

67-400246-1

25 Oct 2024
National Institute of Metrology Thailand (NIMT)

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 67-400505-2

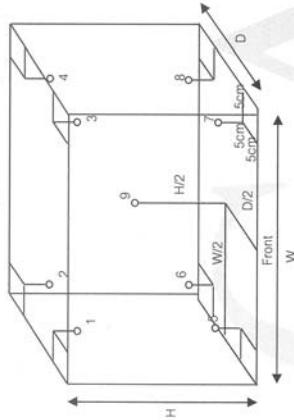
Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
104	110	110	103.4	105.0	104.8	105.0	104.1	103.8	104.2	104.4	104.2	0.96
180	184	184	179.3	182.0	180.1	180.6	180.1	180.4	180.0	180.7	179.9	1.3

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
104	110	110	1.1	0.3	2.0
180	184	184	2.5	0.4	3.3

Remark The uncertainty is not combine uniformity of the air chamber

This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%

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Certificate of Calibration

Equipment: SPECTROPHOTOMETER Certificate No.: C06240454
Model: SP-2100 Issued Date: 16 October 2024
Serial No. (or ID.): KJ0G05083001 (MET-SP 01/46) Job No.: WO-00045898
Manufacturer: HACH Page: 1 of 2
Condition: In Condition
Customer: M E T CO.,LTD.
36/659 Moo 6, Tambol Bangrakpattana,
Amphur Bangbuaithong, Nonthaburi 11110 Thailand.
Environment Condition: Temperature 26.1 °C ± 0.2 °C
Humidity 67.3 %RH ± 2.1 %RH
Calibration Place: M E T CO.,LTD. (Laboratory Room)
36/659 Moo 6, Tambol Bangrakpattana,
Amphur Bangbuaithong, Nonthaburi 11110 Thailand.
Calibration By: Mr.Nattapat Rungrueang
Calibration Date: 16 October 2024
The Method used: In house method, CAL-WI-24, base on ASTM E 275-08 and ASTM E 387-04
Traceability: This certificate is traceable to the CRM maintained by National Institute of Standards and Technology (NIST) through Starna Scientific Limited.
The standard for Wavelength Certificate No. 113620 and 113619
The standard for Photometric Certificate No. 113650

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national laboratories.
The measurement uncertainty stated is the expanded uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.
DKSH Technology Limited
10250 Sukhumvit Road, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand



Calibration Results:
Without Adjustment

Wavelength Accuracy (nm). The spectral bandwidth of Std at 4 nm and UUC at 4 nm				
Standard Wavelength	Unit Under Calibration	Correction	Uncertainty	
334.22	335	-0.78	0.59	
418.48	419	-0.52	0.59	
536.90	536	0.90	0.59	
637.94	637	0.94	0.59	
748.28	748	0.28	0.59	
879.70	879	0.70	0.59	
Photometric Accuracy (Absorbance)				
Wavelength	Standard absorbance	Unit Under Calibration	Correction	Uncertainty
420 nm	0.0000	0.007	-0.0070	0.0045
	0.5797	0.579	0.0007	0.0045
	0.7119	0.714	-0.0021	0.0045
440 nm	1.0124	1.015	-0.0026	0.0045
	0.0000	0.001	-0.0010	0.0045
	0.5634	0.564	-0.0006	0.0045
465 nm	0.7001	0.704	-0.0039	0.0045
	0.9955	1.002	-0.0065	0.0045
	0.0000	0.000	0.0000	0.0045
546.1 nm	0.5239	0.523	0.0009	0.0045
	0.6613	0.660	0.0013	0.0045
	0.9395	0.941	-0.0015	0.0045
590 nm	0.0000	0.000	0.0000	0.0045
	0.5212	0.518	0.0032	0.0045
	0.6977	0.692	0.0057	0.0045
635 nm	0.9927	0.985	0.0077	0.0045
	0.0000	0.000	0.0000	0.0045
	0.5548	0.552	0.0028	0.0045
	0.7732	0.767	0.0062	0.0045
	1.1021	1.093	0.0091	0.0045
	0.0000	0.000	0.0000	0.0045
	0.5621	0.560	0.0021	0.0045
	0.7629	0.758	0.0049	0.0045
	1.0873	1.081	0.0063	0.0045

The End of Certificate
DKSH Technology Limited
10250 Sukhumvit Road, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand



ใบตรวจสอบสภาพเครื่องวัดสิ่งแวดล้อม

เลขที่ใบงาน: WO-00045898

ชนิดเครื่องมือ: SPECTROPHOTOMETER รุ่น: SP-2100 หมายเลขเครื่อง: KJ0G05083001

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
16 Oct 2024			16 Oct 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
General					
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. ความสมบูรณ์เครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสะอาด (ช่องใส่ตัวอย่าง, ภายใน-นอกเครื่อง)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. สวิตช์ ปิด - เปิด เครื่อง (On-Off Switch)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. ปุ่มกด (Keypad)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. หน้าจอ (Display, Screen Contrast)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Spectrophotometer					
<input type="checkbox"/>	<input type="checkbox"/>	6. แรงดันไฟฟ้า (Battery Backup) ≥ 2.5 VDC	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	7. ตัวหมุนเลือกความยาวคลื่น (Wavelength Control)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ความยาวคลื่น (Wavelength Check)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	9. แหล่งกำเนิดแสง (UV $< 3,000$ hour)	<input type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. แหล่งกำเนิดแสง (Visible $< 5,000$ hour)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. ช่องวัดหลายตัวอย่าง (Carousel Module)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
pH Meter and Conductivity Meter					
<input type="checkbox"/>	<input type="checkbox"/>	12. อิเล็กโทรด (Electrode and Connection Cable)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	13. ระดับสารละลายใน Electrode (Level KCl)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	14. ฝาปิดที่ปลาย Electrode (Dust Protection Hood)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	15. ขาจับอิเล็กโทรด (Stand)	<input type="checkbox"/>	<input type="checkbox"/>	
Turbidimeter					
<input type="checkbox"/>	<input type="checkbox"/>	16. ค่าความทึบที่ต่ำสุด (No Sample)	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	17. ระดับการส่องสว่างของแสง (≥ 2.5 ไมเกิน 3.0)	<input type="checkbox"/>	<input type="checkbox"/>	
Automatic titrator					
<input type="checkbox"/>	<input type="checkbox"/>	18. สภาพ Piston Burettes	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	19. Function Rinsing and Dosing	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	20. ระบบท่อสายยางและอุปกรณ์ประกอบ	<input type="checkbox"/>	<input type="checkbox"/>	

เห็นด้วย/แนะนำ :

Mr.Nattapat Rungueang
Service Engineer

บริษัท ฟูนิคัล เทคโนโลยี จำกัด
DKSH Technology Limited
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Phone: +66 2639 71000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

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CAL-FIM-R31-03; 20 Jul 2022

SKYWATCH®

SPEEDWATCH®

seaswatch®

CERTIFICATE OF COMPLIANCE

JDC Electronic SA Switzerland, Avenue des Sports 42, CH-1400 Yverdon-les-Bains declares under our sole responsibility that the product **FLOWATCH®** and all serial numbers to which this declaration relates, is in conformity with following standards or other normative documents:

89/336/EEC

IEC801-2

CISPR11

Electromagnetic Compatibility and Low Voltage Directive 72/73

The technical construction file is maintained at JDC Electronic SA.



JDC Electronic SA
Avenue des Sports 42
CH - 1400 Yverdon-les-Bains
Switzerland

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Certificate of Calibration

Certificate No. : 68-400122-1

Page : 1 of 2

Submitted by :

M E T Company Limited

36/659 Moo 6, T. Bangrakpattana, A. Bangbuatong, Nonthaburi 11110

Equipment :

Temperature Indicator with TC Probe Type K (Temp pH)

Temperature Indicator

Manufacturer : Digicon

Model : PH-235SD

Range : 0 °C to 60 °C

Resolution : 0.1 °C

Serial No. : AL-S8204

ID No. : MET-PH11/67

TC Probe Type K

Model : TP-07

Sheath Material : Stainless

Diameter : 3 mm.

Length : 109 mm.

Serial No. : N/A

ID No. : MET-PH11/67

Environment :

Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Line Voltage : (220 ± 22) VAC

Date of Received :

20 February 2025

Date of Calibration :

28 February 2025

Date of Issue :

28 February 2025

Calibrated by :

Chortip Samchuri

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4003

by compared with PRT in the liquid bath at the constant controlled temperature.

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units

1. Platinum Resistance Thermometer (PRT)

ID No. Cert. No. Due Date

400001 TT-0023-24 16 Feb 2026

Traceability

National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No. Cert. No. Due Date

400003 23E1866 01 Jun 2025

Traceability

National Institute of Metrology Thailand (NIMT)

400004 23E1866 01 Jun 2025

National Institute of Metrology Thailand (NIMT)

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 68-400122-1

Page : 2 of 2

Result of Calibration :

Without Adjustment

UUC Condition As-Received : Good

Function :

Temperature measurement

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
130	10.0022	10.1	-0.1	0.18
130	25.0017	25.0	0.0	0.22
130	50.0022	50.0	0.0	0.27

Remark

UUC : Unit Under Calibration

This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%

-o0o-



Certificate of Calibration

Certificate No. : 68-420022-1

Page : 1 of 2

Submitted by :

M E T Company Limited

36/659 Moo 6, T. Bangrakpattana, A. Bangbuatong, Nonthaburi 11110

Equipment :

pH Meter with electrode

pH meter

Manufacturer : Digicon

Model : PH-235SD

Range : N/A pH

Resolution : 0.01 pH

Serial No. : AL58204

ID No. : MET-PH11/67

Electrode

Model : TF 54074

Serial No. : 435029183

Environment :

Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15) %

Date of Received :

20 February 2025

Date of Calibration :

28 February 2025

Date of Issue :

28 February 2025

Calibrated by :

Permpon Chanpu

Calibration Method : In-house method CAL-M4201 direct measurement by using standard voltage calibrator and using certified reference material (CRM)

Reference Standard Instruments : This certification is traceable to the International System of Units

1. Multiproduct Calibrator

ID No.	Cert.No.	Due Date	Traceability
440001	23E1240	24 Mar 2025	National Institute of Metrology Thailand (NIMT)

2. Standard Buffer Solution

pH	Cert.No.	Lot No.	Exp.Date	Traceability
4.008	61293328	1027612	15 Sep 2026	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.987	61297593	1027614	15 Sep 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
10.010	61306165	1027613	15 Sep 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 68-420022-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement

pH meter

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

Adjustment Curve at nominal pH	Applied Voltage (mV)	Nominal Value (pH)	UUC Reading		Correction (mV)	Uncertainty (± mV)
			(pH)	(mV)		
4, 7, 10	177.4800	4	4.00	177	0	0.58
	0.0000	7	7.00	0	0	0.58
	-177.4800	10	10.00	-177	0	0.58

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

Adjustment Curve at nominal pH	Standard Buffer (pH)	UUC Reading (pH)	Correction (pH)	Uncertainty (± pH)
4, 7, 10	4.008	4.00	0.01	0.0097
	6.987	7.00	-0.01	0.011
	10.010	10.00	0.01	0.014

Remark

UUC : Unit Under Calibration

This result of calibration was found accurate as shown on date and place of calibration only.

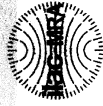
This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%

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CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120
Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.comNSG-TSI-TST 17025
CALIBRATION 0030

Certificate of Calibration

Certificate No. : 68-420008-1

Page : 1 of 2

Submitted by :

M E T Company Limited

36/659 Moo 6, T.Bangrakpattana, A.Banghuatong, Nonthaburi 11110

Equipment :

pH Meter with electrode

pH meter

Manufacturer : Eutech

Model : pH 150

Range : -2.00 to 16.00 pH

Resolution : 0.01 pH

Serial No. : 2657036

ID No. : MET-PH04/60

Electrode

Model : ECF7252101B

Serial No. : 2603242122

ID No. : MET-PH04/60

Environment :

Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15) %

Date of Received :

16 January 2025

Date of Calibration :

23 January 2025

Date of Issue :

23 January 2025

Calibrated by :

Perimon Chanpu

Calibration Method : In-house method CAL-M4201 direct measurement by using standard voltage calibrator and using certified reference material (CRM)

Reference Standard Instruments : This certification is traceable to the International System of Units

1. Multiproduct Calibrator

ID No.	Cert. No.	Due Date	Traceability
440001	23E1240	24 Mar 2025	National Institute of Metrology Thailand (NIMT)

2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.008	61293328	1027612	15 Sep 2026	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.987	61297593	1027614	15 Sep 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
10.010	61306165	1027613	15 Sep 2025	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03

CAL-F0031-03

CAL

Calibratech Co.,Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Bangpood, Pakkred, Nonthaburi 11120
Tel.(02) 964-6211 Fax.(02) 964-5155, e-mail : calibratech.cal@yahoo.com, calibratech.cal@hotmail.com

Certificate of Calibration

Certificate No. : 68-420008-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement

pH meter

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

Adjustment Curve at nominal pH	Applied Voltage (mV)	Nominal Value (pH)	UUC Reading		Correction (mV)	Uncertainty (± mV)
			(pH)	(mV)		
4, 7, 10	177.4800	4	4.00	177.1	0.4	0.060
	0.0000	7	6.98	-0.1	0.1	0.060
	-177.4800	10	10.00	-177.3	-0.2	0.060

Function : pH meter with electrode

Performing a three - buffer standard curve using buffer nominal pH (4,7,10)

Adjustment Curve at nominal pH	Standard Buffer (pH)	UUC Reading (pH)	Correction (pH)	Uncertainty (± pH)
4, 7, 10	4.008	4.01	0.00	0.0097
	6.987	7.00	-0.01	0.011
	10.010	10.01	0.00	0.014

Remark

UUC : Unit Under Calibration

This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%

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Certificate of Calibration

Page : 1 of 2

Certificate No. : 67-400505-1

Submitted by : M E T Company Limited

36/659 Moo 6, T.Bangrakpattana, A.Bangbuatong, Nonthaburi 11110

Equipment : Temperature controlled enclosure (Oven)

Manufacturer : Memmert
Model : UM 100

Range : N/A °C
Resolution : 0.1 °C

Serial No. : b197.0985
ID No. : MET-OV01/46

Environment : On site calibration was carried out at the Laboratory, M E T Company Limited

Ambient Temperature : (30.0 to 31.0) °C

Relative Humidity : (50 to 55) %

Line Voltage : (210.0 to 210.8) V

Date of Received : 20 August 2024

Date of Calibration : 20 August 2024

Date of Issue : 21 August 2024

Calibrated by: Permon Chanpu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Digital Thermometer with Thermocouple probe

ID No.	Cert. No.	Due Date	Traceability

400029 & 400032 67-400247-1 26 Oct 2024
National Institute of Metrology Thailand (NIMT)

The Uncertainties are for a confidence probability of approximately 95%

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CAL-F0031-03

CAL-F0031-03

Certificate of Calibration

Page : 2 of 2

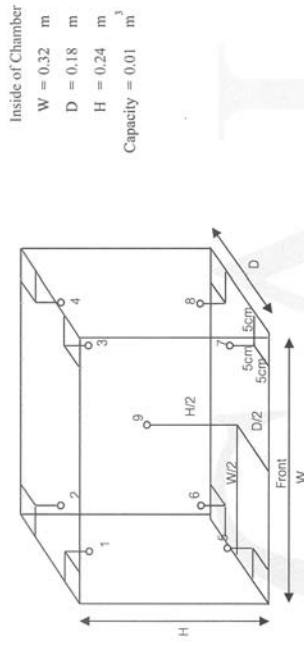
Certificate No. : 67-400505-1

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
180.0	180.0	180.0	181.6	181.2	181.9	180.7	180.7	181.9	179.2	179.1	180.8	0.95

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)	Measured Stability (°C)	Overall Variation (°C)
180.0	180.0	180.0	1.9	0.2	3.1

Remark The uncertainty is not combine uniformity of the air chamber

This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%

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Certificate of Calibration

Page : 1 of 2

Certificate No. : 67-400505-5

Submitted by : M E T Company Limited

Equipment : Temperature controlled enclosure (Incubator)

Manufacturer : M-LAB
Range : N/A °C
Serial No. : 240412
Model : BIC-140
Resolution : 0.1 °C
ID No. : MET-BI01/55

Environment : On site calibration was carried out at the Laboratory, M E T Company Limited

Ambient Temperature : (26.0 to 26.5) °C

Relative Humidity : (40 to 45) %

Line Voltage : (210.0 to 210.8) V

Date of Received : 20 August 2024

Date of Calibration : 20 August 2024

Date of Issue : 21 August 2024

Calibrated by : Permpon Chaupu

Calibration Method : CAL-M4004, TLAS G-20

The temperature scale used was based on ITS-90

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Digital Thermometer with RTD Probe

ID No.	Cert. No.	Due Date	Traceability
400029 & 400043	67-400245-1	27 Oct 2024	National Institute of Metrology Thailand (NIMT)

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 Calibratech Co.,Ltd.



Certificate of Calibration

Page : 2 of 2

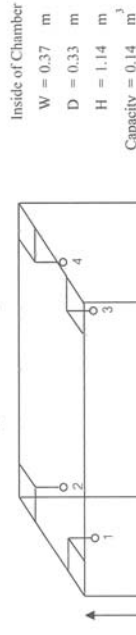
Certificate No. : 67-400505-5

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

This instrument was setting air ventilation at position 0 (close)



Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Temperature (°C) @ Sensor No.									Uncertainty (± °C)
			1	2	3	4	5	6	7	8	9	
20.0	20.0	20.0	19.77	19.63	19.60	19.50	20.50	20.34	20.20	19.86	20.04	0.33

Test Point (°C)	Setting Temperature (°C)	Indicating Temperature (°C)	Measured Uniformity (°C)		Measured Stability (°C)		Overall Variation (°C)
			0.58	0.06	0.06	1.07	

Remark The uncertainty is not combine uniformity of the air chamber

This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%

- oDo -





Certificate of Calibration

Equipment: COD Reactor
Model: DB1602
Serial No. (or ID.): 0169
Manufacturer: M-LAB
Condition: In Condition
Covers: Open (Max)
Locations heating Block: Single

Certificate No.: C17240180
Issued Date: 29 October 2024
Job No.: WO-00047579
Page: 1 of 4

Customer: M E T CO.,LTD.
36/659 Moo 6, Tambol Bangrakpattana,
Amphur Bangbuathong, Nonthaburi 11110 Thailand.

Environment Condition: Temperature: 28 °C ± 0.9 °C
Humidity: 58 %RH ± 5.1 %RH
Voltage: 229 VAC ± 3.9 VAC

Calibration Place: M E T CO.,LTD. (Laboratory Room)
36/659 Moo 6, Tambol Bangrakpattana,
Amphur Bangbuathong, Nonthaburi 11110 Thailand.

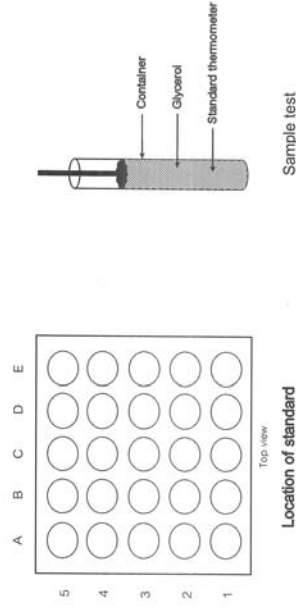
Calibration By: Mr. Nakarin Ruenros
Calibration Date: 28 October 2024
The Method used: In house method, CAL-WI-59, base on Direct Measurement with Standard Thermometer
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Limited.
Certificate No. C10240016

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.



Certificate No.: C17240180

Page: 2 of 4



Standard Installation Locations

The standard thermometer touches the lower end of the boring

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the unit under calibration.

Measured Temperature: The average reading of standards at any positions or location.

Measured Stability: The one-half of greatest maximum difference of measured temperatures at any one probe.



DKSH

Certificate No.: C17240180 Page: 3 of 4

Calibration Results:
Before Adjustment

Locations heating Block:		Setting (°C)		Unit Under Calibration (°C)		
Single		150.0		150.0		
Location heating Block:		A1	A2	A3	A4	A5
Measured Temperature (°C)		146.78	146.54	146.81	147.54	146.45
Location heating Block:		B1	B2	B3	B4	B5
Measured Temperature (°C)		145.67	147.87	146.52	148.41	147.12
Location heating Block:		C1	C2	C3	C4	C5
Measured Temperature (°C)		145.90	147.99	149.21	147.88	146.56
Location heating Block:		D1	D2	D3	D4	D5
Measured Temperature (°C)		147.16	147.34	148.23	148.09	146.65
Location heating Block:		E1	E2	E3	E4	E5
Measured Temperature (°C)		146.31	148.42	148.67	148.26	147.45

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 หมู่ 10 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 10260
โทรศัพท์ : +66 2639 7000 โทรสาร : +66 2639 7001
Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - In Asia and Beyond.

CAL-FM-C17-08: 20 Jul 2022



DKSH

Certificate No.: C17240180

Page: 4 of 4

Calibration Results:
After Adjustment

Measured temperature at the spread locations:

Locations heating Block:		Setting (°C)		Unit Under Calibration (°C)	
Single		150.0		150.0	

Location heating Block:		Measured Temperature (°C)		Correction of UUC (°C)		Uncertainty (± °C)	
		A1	149.74	-0.26		0.30	
		A2	149.00	-1.00		0.31	
		A3	149.61	-0.39		0.30	
		A4	149.65	-0.35		0.31	
		A5	150.15	0.15		0.31	
		B1	149.34	-0.66		0.30	
		B2	151.09	1.09		0.31	
		B3	149.19	-0.81		0.33	
		B4	150.76	0.76		0.33	
		B5	149.58	-0.42		0.31	
		C1	148.85	-1.15		0.31	
		C2	150.41	0.41		0.31	
		C3	151.36	1.36		0.32	
		C4	150.02	0.02		0.34	
		C5	148.94	-1.06		0.34	
		D1	148.79	-1.21		0.31	
		D2	149.79	-0.21		0.32	
		D3	150.77	0.77		0.30	
		D4	150.52	0.52		0.30	
		D5	149.34	-0.66		0.32	
		E1	150.36	0.36		0.31	
		E2	150.27	0.27		0.30	
		E3	150.30	0.30		0.31	
		E4	150.79	0.79		0.32	
		E5	150.28	0.28		0.30	

Characterization of the unit under calibration:

Locations heating Block	Desired (°C)		Unit Under Calibration (°C)		Measured Temperature (°C)	
			Setting	Reading	Stability (± °C)	
Single	150.0		150.0	150.0	0.14	

The End of Certificate

บริษัท ดีเคเอส อีเซีย จำกัด
DKSH Technology Limited
2533 หมู่ 10 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 10260
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CAL-FM-C17-08: 20 Jul 2022



ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

ชนิดเครื่องมือ: COD Reactor
หมายเลขเครื่อง: 0169
เลขที่ใบงาน: WO-00047579
รุ่น: DB1602

ตรวจสอบ (รับ)		รายการตรวจเช็ค		ตรวจสอบ (ส่ง)		หมายเหตุ
28 Oct 2024				28 Oct 2024		
ปกติ	ไม่ปกติ			ปกติ	ไม่ปกติ	
		General				
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. สภาพ Hole		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพฝาปิด		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพตู้เครื่อง		<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง		<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ:



Harikul Science Co.,Ltd.
694 Soi Ratchadaniwet 24, Pracharatbampheh,
Samsaenok, Huakhwang, Bangkok 10310
Tel: 0-2274-2456 Fac: 0-2274-2443
Email: info@harikul.com www.harikul.com
Certificate of Calibration

CERT.No.: HS-V083L

Calibration Date : 2 Dec 24

Submitted by : MET CO.,LTD

36/659 Moo. 6, Bang Rak Phatthana,

Bang Bua Thong, Northaburi 11110

Model : YSI 5000

S/N : 15G103969

Probe : YSI 5010

S/N : 15K100353

ID NO. : -

Air Temp ref : SN: F8065C26

Barometric ref : SN: F8065C26

Water Temp ref : -

ID NO. : HS001

Technician : Kitipong M.

Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(status)	(status)
Measurement 1 (mg/l)	9.08	(PASS)	-
Measurement 2 (mg/l)	9.08	(PASS)	-
Measurement 3 (mg/l)	9.07	(PASS)	-
Measurement 4 (mg/l)	9.08	(PASS)	-
Measurement 5 (mg/l)	9.07	(PASS)	-
Measurement 6 (mg/l)	9.08	(PASS)	-
Measurement 7 (mg/l)	9.07	(PASS)	-
Measurement 8 (mg/l)	9.07	(PASS)	-
Measurement 9 (mg/l)	9.07	(PASS)	-
Measurement 10 (mg/l)	9.07	(PASS)	-

Mean Measurement

Inaccuracy

9.07

0.02

(PASS)

Overall Status

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

- 1) This certificate is issued based on the result that are found as shown on date and place of test only.
- 2) The calibration procedure followed in accordance with Harikul Science Co., Ltd.
- 3) This result shall not be used for advertising purpose.

Packing List

Unit : K-446 Kjeldigester standard



15111112791000281006111

Serial Number

1000281006

Page 1(1)

Item	Pieces	Description	
11059833	1.0000	Packing parts Kjeldigester K-446/K-449 Beipackteile K-446/K-449	OK
037377	5.0000	Sample tubes 300 ml (set of 4) Probengläser 300 ml (Set à 4 Stück)	OK
11059754	1.0000	Rack 20 cpl. Rack 20 kpl.	OK
11059855	1.0000	Aspiration device Kjeldigester K-446/K-449 cpl. Absaugereinheit K-446/K-449	OK
040444	1.0000	Weighing boat 20pcs. Wägeschiffchen 20 Stk.	OK
010020	1.0000	Power cable type USA, 3 pole 120V Anschlusskabel USA W 120V	OK
11058825	1.0000	Fume collection tube with ball joint Dampfsammelrohr mit Kugelschiff	OK
11592548	1.0000	Kjeldahl Practice Guide en Kjeldahl Practice Guide en	OK
11593546	1.0000	Operation Manual K-446/K-449 english Bedienungsanleitung K-446/K-449 english	OK
11593635	1.0000	Supplementary sheet Kjeldigester K-446/K-449 Beiblatt K-446/K-449	OK



BUCHI Certificate Final Test Inspection

Unit : BÜCHI Kjeldigester K-446

Serial number 1000281006

Examination Procedure

1. Visual control of the glass parts and the unit

- No scratches on the coated surface
- Mounted in accordance to the specific drawing

OK

2. Security tests

- High voltage test in accordance with EN 61010-1 (IEC 1010)
- Ground connection test in accordance with EN 61010-1 (IEC 1010)

OK

3. Functional tests Operating panel

- All buttons are working
- Cooling system is working after the instrument has been switched on

OK

Connector plugs

- Scrubber connector is working

OK

Heating element

- Heating-up temperature 420 °C is reached after 40 minutes
- Temperature calibration at 420 °C (3 measuring points)

OK

4. Completeness of order checked

BUCHI Labortechnik AG hereby declares that this unit is in accordance with the specifications

Packing List

Unit : K-415 TripleScrub 230V



15111112781000281005111

Serial Number

1000281005

Page 1(1)

Item	Pieces	Description	
11057332	1.0000	Tray for adsorption storage Ablage für Adsorption	OK
048355	1.0000	Silicone hose D6/9 L=3m Silikonschlauch D6/9 L=3,0m	OK
033701	1.0000	Glass wool 30g Glaswolle 30g	OK
028737	2.0000	Hose clamp Anschlussklemme	OK
11064971	1.0000	Activated Charcoal 2.6mm, 150g Aktivkohle 2.6mm, 150g	OK
010020	1.0000	Power cable type USA, 3 pole 120V Anschlusskabel USA W 120V	OK
11593505	1.0000	Operation Manual K-415 english Bedienungsanleitung K-415 englisch	OK



BUCHI Certificate
Final Test Inspection

Unit : BÜCHI Scrubber K-415

Serial number 1000281005

Examination Procedure

1. Visual control of the glass parts and the unit

- No scratches or splinters on the glass parts
- Mounted in accordance to the specific drawing

OK

2. Security tests

- High voltage test in accordance with EN 61010-1 (IEC 1010)
- Ground connection test in accordance with EN 61010-1 (IEC 1010)

OK

3. Functional tests

Vacuum test

- Bypass valve open: Pressure is 0 - 65 mbar below the atmospheric pressure
- Bypass valve closed: Pressure is 400 mbar (+/- 10 %) below the atmospheric pressure

OK

4. Completeness of order checked

OK

BÜCHI Labortechnik AG hereby declares that this unit is in accordance with the specifications

Packing List

Unit : K-360 Plastik Basic



15111113001000281014111

Serial Number

1000281014

Page 1(1)

Item	Pieces	Description	
043410	3.0000	Canister 10L thin-walled Kanister 10L dünnwandig	OK ✓
043603	1.0000	Packing parts K-360 Beipackteile K-360	OK ✓
047871	1.0000	Suppl. sheet distillation unit Beiblatt Distillation Unit	OK ✓
010020	1.0000	Power cable type USA, 3 pole 120V Anschlusskabel USA W 120V	OK ✓
11592548	1.0000	Kjeldahl Practice Guide en Kjeldahl Practice Guide en	OK ✓
093176	1.0000	Operation Manual K-360 english Bedienungsanleitung K-360 englisch	OK ✓

Packed by



BUCHI Certificate
Final Test Inspection

Unit : BÜCHI BjeFlex K-360

Serial number 1000281014

Examination Procedure

1. Visual control of the glass parts and the unit

- No scratches on the coated surface or splinters on the glass parts
- Mounted in accordance to the specific drawing

OK ✓

2. Security tests

- High voltage test in accordance with EN 61010-1:2002 (IEC 61010-1:VDE 0411)
- Ground connection test in accordance with EN 61010-1:2002 (IEC 61010-1:VDE 0411)
- Safety door sensor checked

OK ✓

3. Functional tests

Electronics

- Electronic modul is tested with the checking device PG157
- Connector plugs are working

OK ✓

Operating panel

- Display is working
- All buttons of the keypad are working

OK ✓

Pump testing

- All pumps are working
- All pumps (exception: water pump of the steam generator) are precalibrated

OK ✓

Valve testing

- All valves are working

OK ✓

Steam generator testing

- The steam generator is filled with water
- The steam generator valve is working
- The amount of distillate corresponds to specifications

OK ✓

Further testing

- Beeper is working

OK ✓

4. Unit configuration and completeness of order checked

BUCHI Labortechnik AG hereby declares that this unit is in accordance with the specifications





Optima8000 Preventive Maintenance Report

Company Name: MET Company Limited.

Instrument Location: 36 659 Soi Mu Ban Monwadi Park 6,
Bang Rak Phatthana, Bang Bua Thong District, Nonthaburi 11110

Instrument Serial No.: 078S1407053C

Date: 02-Dec-2024

ICP-OES/Optima8000 Preventive Maintenance (PM)					
Company Name:		MET Company Limited.			
Address (Instrument Location):		Bang Rak Phatthana, Bang Bua Thong District, Nonthaburi 11110			
Serial Number:		078S1407053C	PM Number:	1 of 2	
Customer Name (if applicable):		K. Sasithon	Telephone Number:	065 850 0726	
Service Engineer Name:		Khwanchai	Service Order Number:	WO-02950877	
Date PM Performed: (DD-MM-YYYY)		02-Dec-2024	Next PM Due Date: (DD-MM-YYYY)	02-Jun-2025	
Standard Labor Hours to Complete PM :					4 hours

Part Number	Release	Publication Date
09370140 Rev.5	A	January 2018

Scope
The purpose of this PM is to ensure the continued functionality of the PerkinElmer/Optima8000 by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.
The customer should save their method before the PM begins.

General Instructions:
The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM. Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
Optima8000	078S1407053C	Winlab V 5.5.0.0714
S10 Autosampler		

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
09995098	Air Filter-Spectrometer	1
N077520	Air Filter-RF Generator	1
09992731	Axial Window	1
B0810377	Radial Window	1
N0770438	O-ring kit, injector support adapter	1
N0780437	O-ring kit, torch	1

Additional Reagents and Standards Required for PM			
Part Number (if applicable)	Description	Quantity	Batch/Lot # Expiration Date: (MM/YY)
N0691579	Multi-Element Standard (N069-1579 diluted 10X)	1	62-162CRX1 12/25
N9300221	Instrument Calibration-4 (N9300221 diluted 100X)	1	61-190CRY1 08/25

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ✓ Ask customer about unit's performance since last visit.
- ✓ Check incoming AC line voltage under load for proper levels and grounding.
- ✓ Is the instrument operational?

2. Mechanical:

- ✓ Inspect and clean all fans and filters.
- ✓ Inspect and replace torch components and necessary.
Torch Components Replaced: ☐Yes ☒No
If yes, list components replaced:
- ✓ Inspect all tubing for signs of cracking or leaking and replace as necessary.
Tubing Replaced: ☒Yes ☐No
If yes, list tubing replaced:
- ✓ Inspect the peristaltic pump for proper operation.
- ✓ Check and adjust if necessary, the external nitrogen, argon shear gas and water supply pressures.
- ✓ Check and adjust if necessary, the internal nitrogen, main argon, torch argon and shear gas pressures

Regulator	Measured Pressure	Set Pressure
Nitrogen	N/A	NA (calibrated in Factory)
Main Argon	76	76psig
Torch Argon	67	67psig
Shear Gas	65	65psig
Water	35	35psi

- ✓ Check the shear gas nozzle for blockages and proper, uniform flow.
- ✓ Inspect nitrogen H/Low purge and shear gas solenoids for proper function.
- ✓ Inspect the function of all spectrometer motors. Drive the motors from the Spectrometer DCM. Check all motors, couplings, set screws, gears or drive assembly located on the spectrometer (prism/grating wavelength drives, slits, shutter, DV mirror, X/Y mirror) if problems are found.
- ✓ Perform preventative maintenance on the chiller as required. Make the customer aware of the importance of maintaining the chiller fluid level and filter replacement.
- ✓ Drain air compressor surge tank.
- ✓ Clean exterior of instrument.

3. Electrical:

- ☒ Visually inspect all PC boards for cleanliness and signs of corrosion.
- ☒ Check all RF generator and spectrometer power supply voltages.
- ☒ Run instrument diagnostic checks from the appropriate Device Control Module.

RF Generator:

- ☒ Check the RF generator status screens.
- ☒ Check the function of all interlocks.

Spectrometer:

- ☒ Check the spectrometer status screens.
- ☒ Check for proper function of all motors from the Motor Control window.

4. Optical:

- ☒ Check the neon lamp for proper operation.
- ☒ Ensure that neon initialization passes at power up.
- ☒ Ensure that there is a single, well defined peak of sufficient intensity (approximately 15,000 to 60,000 cts.) for the 703.241nm neon line viewed in the DCM Collect Spectra window. Re-generate the neon correction table if problems are encountered. If problems are still exhibited after the table is re-generated, replace the neon lamp assembly.

Neon Lamp Replaced: ☐ Yes ☒ No

- ☒ Perform the Initialize Optics routine from the Spectrometer Control window.
- ☒ Insure that the routine passes with no error codes. If it fails, run a manual prism scan from the spectrometer DCM.
- ☒ Check the Dark Current measurement (Detector Calibration) passes at initialization.
- ☒ Check prism/electronics temperature sensor readback values from the DCM. It is normal for these readings to be shown in red. A typical prism temperature is approximately 29.5 degree C. A typical electronics temperature is approximately 35 degree C.
- ☒ Check the detector temperature from the DCM for -7.0 to -8.5 degree C. If outside of this range the detector cooling fan may not be operational. Further inspection may be necessary.
- ☒ Inspect for proper function of the transfer optics. 1) shutter 2) DV mirror 3) X/Y mirror.

Clean or replace the axial and radial view windows as necessary.

Axial Window Replaced: ☒ Yes ☐ No

Radial Window Replaced: ☒ Yes ☐ No

5. Post PM Performance Tests:

- ☒ Perform View Align.

5.1 Spectral Resolution:

- ☒ Measure the spectrometers ability to separate two adjacent wavelengths.

Parameter	Specification	Test Result	Pass/Fail
As 193.696 - Resolution	≤0.009	0.00694	Passed
Ni 231.604 - Resolution	≤0.011	0.00847	Passed
Ni 341.476 - Resolution	≤0.015	0.01234	Passed
Ba 455.403 - Resolution	≤0.020	0.01552	Passed

5.2 Precision:

- ☒ Test for reproducibility of a set of measurement.

Parameter	Specification	Test Result	Pass/Fail
Zn 213.856	%RSD ≤ 1 %	0.99	Passed
Mg 280.856	%RSD ≤ 1 %	0.68	Passed
Mg 285.207	%RSD ≤ 1 %	0.27	Passed
Ba 455.403	%RSD ≤ 1 %	0.23	Passed

5.3 Mn BEC:

- ☒ Run Axial and Radial BEC according to the A&T spec, or the commissioning test procedure.

Mn Background Equivalent Concentration:

Method "MnBEC" For Samples "IB (2%HNO3)" and "IS (NO69-1579/10)", record intensities.

Calculated BEC: BEC = (IB * Conc of Std) / (IS - IB). Where Conc of Std = 1,000 PPB

Element	Mode	Conc.	IB	IS
Mn 257.610	Radial	1,000 ppb	13533.7	651501.9
Mn 257.610	Axial	1,000 ppb	79071.6	4397761.7
Mn 257.610	IB*Conc.	IS - IB	BEC	Spec
Radial	13533700	637988.2	21.21	<30 PPB
Axial	79071600	4318690.1	18.31	<30 PPB

6. Review:

- ☒ Review with the customer PM work performed.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for ICP-OES/Optima8000 have been completed.	
This ICP-OES/Optima8000 Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative:	Date: 02-Dec-2024 (DD-MMM-YYYY)
Authorized Customer Representative:	Date: 02-Dec-2024 (DD-MMM-YYYY)



National Institute of Metrology (Thailand)

Certificate of Calibration

Certificate No. : AA-2019-24
Issued by : Acoustics Laboratory
Acoustics and Vibration Group



MEASUREMENT ITEM : Sound Calibrator
MANUFACTURER : RION
MODEL/TYPE : NC-75
SERIAL NUMBER : 34480442
CUSTOMER : MET Co., Ltd.
36/659, Moo 6, T.Bangrakphatthana, A.Bangbuathong,
Nonthaburi 11110

MEASUREMENT DATE : 17 July 2024

The reported measurement result relates only to the measurand and applies only at the time of measurement.
The calibration results only marked with an asterisk * in this certificate are not included in the scope of accreditation.

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 calibration certificate may not be reproduced other than in full except with the permission of the Director of National Institute of Metrology (Thailand).

Reference: ATN/55-01/24 Date: 24 July 2024

Authorized Signatory

This certificate is consistent with the capabilities that are included in Appendix C of the MRA drawn up by the CIPM. Under the MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C (for details see <http://www.bipm.org>).

National Institute of Metrology (Thailand)

Ministry of Higher Education, Science, Research and Innovation
3/4-5 Moo 3, Klong Luang, Pathumthani 12120, Thailand. Tel: (66) 2577 5100, Fax: (66) 2577 3659
75/7 Rama VI Road, Rachathewi, Bangkok 10400, Thailand. Tel: (66) 2354 3700, Fax: (66) 2354 3692



UNCERTAINTY OF MEASUREMENT

The stated uncertainty is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k=2$. It has been determined in accordance with EA publication EA-4/02 M:2022 "Evaluation of the Uncertainty of Measurement in Calibration" and JCGM 100:2008 "Evaluation of measurement data --Guide to the Expression of Uncertainty in Measurement (GUM 1995 with minor corrections)". The value of the measured lies within the assigned range of value with a probability of 95 %.

Parameter	Uncertainty at SP1.94 dB	Maximum-permitted uncertainty of measurement for a coverage probability of 95%	Unit
1.Sound Pressure level	0.07	0.15	dB
2. Frequency	0.1	0.2	%
3. THD+N	0.1	0.5	%

TRACEABILITY

This certificate provides traceability of measurement to recognized national standards, and to the realization of the International System of Units (SI).



ENVIRONMENTAL CONDITIONS

Ambient condition in the laboratory are as follows :

Temperature	: (23.0 ± 1.0) °C
Pressure	: (101.325 ± 1.500) kPa
Relative Humidity	: (50.0 ± 15.0) %

Reference Condition : 101.325 kPa, 23.0 °C and 50.0 %RH.

Calibration Condition

Preconditionings : 16 hours at ambient conditions.

Measurement Conditions : The average values during measurement are

(99.947 ± 0.036) kPa, (22.5 ± 0.3) °C and (49.3 ± 2.1) %RH

MEASUREMENT METHOD

The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone. The insert voltage technique was employed and the measurement procedure was based on IEC 60942-2017.

Reference Microphone

4180 serial no.1395446

TABULATION OF RESULTS

The following tables give the calibration results and associated measurement uncertainties at 95% of confidence level. The calibration results of sound pressure level which quoted in dB with reference to 20 µPa are corrected to the values under the reference environmental conditions.

The calibration results exclude the calibrator pressure correction but include the microphone volume correction, which was obtained from the manufacturer instruction manual of the sound calibrator, at the level of 0 dB.



MEASUREMENT RESULTS

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value ^[1] (dB)	Acceptance Limit ^[2] (dB)
94	94.18	0.18	± 0.25
Microphone 4180 Serial No.1395446			

Note ^[1] : The deviated value is the absolute value of the difference between the measured value and the corresponding specified sound pressure level.

Note ^[2] : The acceptance limit is obtained from IEC 60942: 2017.

2. Frequency*

Specified Frequency (Hz)	Measured value (Hz)	Deviated value ^[3] (%)	Acceptance Limit ^[4] (%)
1000	1000.0	0.0	± 0.7
At the sound pressure level of 94 dB			

Note ^[3] : The deviated value is the absolute value of the difference in percent between the measured value and the corresponding specified frequency.

Note ^[4] : The acceptance limit is obtained from IEC 60942: 2017.



3. Total distortion + Noise*

Microphone 4180 Serial No.1395446

Measured value ^[5] (%)	Maximum total distortion + Noise ^[6] (%)
At the sound pressure level of 94 dB	
0.2	2.5

Note ^[5] : The measured value is the total distortion, measured over the frequency range from 20 Hz to 20 kHz.

Note ^[6] : The maximum total distortion + noise is obtained from IEC 60942: 2017.





Certificate of Calibration



Certificate Number : SPR24100185-1

Customer : MET CO.,LTD.

36/659 Moo. 6 Tambol Bangragpattana, Amphur Bangbuatong,
Nonthaburi 11110

Page : 1 of 3

Equipment Name : Sound Level Meter
Manufacturer : ACO
Model : 6236
Serial Number : 222065
ID. Number : SLM-7

Environmental Conditions

Ambient Temperature : 23 °C ± 3 °C Received Date : 10 Oct 2024
Relative Humidity : 50 % ± 15 % Calibration Date : 11 Oct 2024
Location of Calibration : In-Lab Recommend Due Date : 11 Oct 2025
Calibration Procedure : SP-CPE-04-01 Date of Issue : 12 Oct 2024

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 :

Calibration Officer

App



Calibration Report

Certificate Number : SPR24100185-1

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate Number : SPR24100185-1

Range : 94 to 114 dB

Select A Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select C Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.8	113.8	-0.2	-0.2	0.15

Select Z Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.8	113.8	-0.2	-0.2	0.15

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 = 2.00, providing a level of confidence approximately 95%. - End of Certificate -



Certificate of Calibration

Certificate Number : SPR24100185-2

Customer : MET CO.,LTD.

36/659 Moo. 6 Tambol Bangragpattana, Amphur Bangbuatong, Nonthaburi 11110

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 222066

ID. Number : SLM-8

Environmental Conditions

Ambient Temperature : 23 °C ± 3 °C

Relative Humidity : 50 % ± 15 %

Location of Calibration : In-Lab

Calibration Procedure : SP-CPE-04-01

Received Date : 10 Oct 2024

Calibration Date : 11 Oct 2024

Recommend Due Date : 11 Oct 2025

Date of Issue : 12 Oct 2024

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 : Calibration Officer



Calibration Report

Certificate Number : SPR24100185-2

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate Number : SPR24100185-2

Page : 3 of 3

Range : 94 to 114 dB Function : @1kHz

Select A	Standard Setting	UUC Reading		Error		Uncertainty (±)
		Fast	Slow	Fast	Slow	
94	94	94.0	94.0	0.0	0.0	0.15
114	114	113.9	113.9	-0.1	-0.1	0.15

Unit : dB

Select C	Standard Setting	UUC Reading		Error		Uncertainty (±)
		Fast	Slow	Fast	Slow	
94	94	93.9	93.9	-0.1	-0.1	0.15
114	114	113.9	113.9	-0.1	-0.1	0.15

Unit : dB

Select Z	Standard Setting	UUC Reading		Error		Uncertainty (±)
		Fast	Slow	Fast	Slow	
94	94	93.9	93.9	-0.1	-0.1	0.15
114	114	113.8	113.8	-0.2	-0.2	0.15

Unit : dB

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 $k = 2.00$, providing a level of confidence approximately 95%.

– End of Certificate –



Certificate of Calibration

Certificate Number : SPR24100185-3

Customer : MET CO.,LTD.

36/659 Moo. 6 Tambol Bangragpattana, Amphur Bangbuatong,
Nonthaburi 11110

Page : 1 of 3

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 222073

ID. Number : SLM-15

Environmental Conditions

Ambient Temperature : 23 °C ± 3 °C Received Date : 10 Oct 2024

Relative Humidity : 50 % ± 15 % Calibration Date : 11 Oct 2024

Location of Calibration : In-Lab Recommend Due Date : 11 Oct 2025

Calibration Procedure : SP-CPE-04-01 Date of Issue : 12 Oct 2024

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 :

Calibration Officer



Calibration Report

Certificate Number : SPR24100185-3

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



ID LINE : ECT7925



Result of Calibration

Certificate Number : SPR24100185-3

Page : 3 of 3

Range : 94 to 114 dB

Function : @1kHz

Select A Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.8	93.8	-0.2	-0.2	0.15
114	113.7	113.7	-0.3	-0.3	0.15

Select C Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.8	93.8	-0.2	-0.2	0.15
114	113.7	113.7	-0.3	-0.3	0.15

Select Z Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.8	113.8	-0.2	-0.2	0.15

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 $k = 2.00$, providing a level of confidence approximately 95%.
- End of Certificate -

Calibrated by :

Calibration Officer

Certificate of Calibration

Certificate Number : SPR24100185-4

Page : 1 of 3

Customer : MET CO.,LTD.

36/659 Moo. 6 Tambol Bangragpattana, Amphur Bangbuatong,
Nonthaburi 11110

Equipment Name : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial Number : 222103

ID. Number : SLM-18

Environmental Conditions

Ambient Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Received Date : 10 Oct 2024

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

Calibration Date : 11 Oct 2024

Location of Calibration : In-Lab

Recommend Due Date : 11 Oct 2025

Calibration Procedure : SP-CPE-04-01

Date of Issue : 12 Oct 2024

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).



Calibration Report

Certificate Number : SPR24100185-4

Page : 2 of 3

Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Sound Level Calibrator	ST-120	211203773	EEL.BP. 140/0167	26 Jan 2025

Traceability

This certification is traceable to the International System of Unit maintained at :
TISTR - Thailand Institute of Scientific and Technological Research



Result of Calibration

Certificate Number : SPR24100185-4

Page : 3 of 3

Range : 94 to 114 dB Function : @1kHz

Select A

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	114.0	114.0	0.0	0.0	0.15

Select C

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	94.0	94.0	0.0	0.0	0.15
114	113.9	113.9	-0.1	-0.1	0.15

Select Z

Unit : dB

Standard Setting	UUC Reading		Error		Uncertainty (±)
	Fast	Slow	Fast	Slow	
94	93.9	93.9	-0.1	-0.1	0.15
114	113.9	113.9	-0.1	-0.1	0.15

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

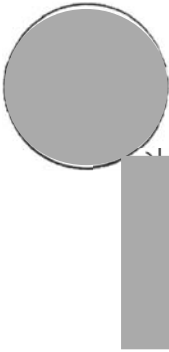
The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95%.
- End of Certificate -



CERTIFICATE OF CALIBRATION

NO. 20241017114

Name of Product:	Sound Level Meter
Model:	ST-21D
Serial Number:	820794
Specification:	Class 2
Conclusion:	Pass
Date of calibration:	2024-10-17
Due Date:	2025-10-16



- I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpasses then, and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspection: OK
2. Type & serial No. of Microphone: AWA14421A-000450
3. Adjustments to indicated sound levels:
Type of Calibrator:B&K 4231
Sound Pressure Level 94.0 dB
4. Measuring up limit: 138.dBA
5. Frequency weightings (Acoustic signal tests for Z weighing, other electric signal tests.)

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
20	-50.4	-6.1	-0.1	1000	0.1	0.0	0.0
31.5	-39.4	-3.1	-0.1	2000	1.3	-0.1	0.0
63	-26.2	-0.8	0.0	4000	1.3	-0.6	0.0
125	-16.2	-0.2	0.0	8000	-1.2	-3.2	0.0
250	-8.6	0.0	0.0	12500	-11.0	-13.0	0.0
500	-3.2	0.0	0.0	/	/	/	/

6. Self-generated noise
- Microphone replaced by electrical input signal device

24.9 dB(A)	25.2 dB(C)	33.7 dB(Z)
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7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.2
Rate of the S weighting decrease (dB/s)	4.4
Deviation of F&S	-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 10dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.1 dB

Max error at 10dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB		
	LAFmax-LA	LASmax-LA	LAE-LA
500	0.0	-4.0	-2.9
200	-1.0	-7.4	-6.9
2	-18.2	-26.9	-26.9
0.25	-27.1	/	-36.1

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.5	3.5	2.3	2.4	2.3	2.4

11. Overload indication: _Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level 123.0 dB

Sweep amplitude 40 dB

Scan cycle time 60 S; Measurement period 180 S

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq, T	113.3	113.4	-0.1
L5	121.0	121.0	0.0
L10	119.0	119.0	0.0
L50	103.0	103.0	0.0
L90	87.1	87.0	0.1
L95	85.1	85.0	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions

Air temperature: 20 °C
Relative humidity: 50 %
Static pressure: 101.8 kPa

Test specifications:

- All Scarlet's Sound level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMF P004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests



CERTIFICATE OF CALIBRATION

NO. 20241017133

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	820893
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-10-17
Due Date:	2025-10-16

- This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpasses then, and applies only to the unit identified above.
- This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

- Preliminary inspection: OK
- Type & serial No. of Microphone: AWA14425-58&33
- Adjustments to indicated sound levels:
Type of Calibrator: B&K 4231 Sound Pressure Level 94.0 dB
- Measuring up limit: 140 dBa
- Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-71.2	-14.3	-0.2	1000	0.0	0.0	-0.1
20	-50.1	-6.2	-0.2	2000	0.1	-0.1	-0.1
31.5	-39.2	-2.5	-0.1	4000	1.3	-0.8	-0.1
63	-26.1	-0.2	-0.1	8000	-1.0	-3.2	0.0
125	-16.2	-0.1	0.1	12500	-11.5	-13.5	0.1
250	-8.7	0.0	-0.1	16000	-11.5	-13.7	0.1
500	-3.3	0.2	-0.1	20000	-23.9	-25.9	-0.1

6. Self-generated noise

Microphone replaced by electrical input signal device

7.0 dB(A)	12.9 dB(C)	14.8 dB(Z)
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7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.2
Rate of the S weighting decrease (dB/s)	4.4
Deviation of F&S	-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.1 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB			
	LAFmax-LA	LASmax-LA	LAE-LA	LAeqT-LA
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.1	-26.9	-26.9	-7.0
0.25	-27.2	/	-36.0	-7.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.5	3.5	2.4	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level 112.8 dB

Sweep amplitude 40 dB

Scan cycle time 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.2	0.0
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.8	0.1
L95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions:

Air temperature: 20 °C

Relative humidity: 50 %

Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2024-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2024-10-15	CIGISMEC
Signal generator	DS 340	33873	2024-10-15	CEPREI

Test specifications:

1. All Scarlett's Sound level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMP004-CA-152.
2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
3. The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

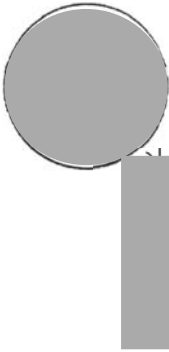
IEC 61672-3 Sound Level Meters Part 3: Periodic tests



CERTIFICATE OF CALIBRATION

NO. 20241017161

Name of Product:	Sound Level Meter
Model:	ST-21D
Serial Number:	821036
Specification:	Class 2
Conclusion:	Pass
Date of calibration:	2024-10-17
Due Date:	2025-10-16



- I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them, and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspection: OK
2. Type & serial No. of Microphone: AWA14421A-000613
3. Adjustments to indicated sound levels:
Type of Calibrator:B&K 4231
Sound Pressure Level 94.0 dB
4. Measuring up limit: 138.dBA
5. Frequency weightings (Acoustic signal tests for Z weighing, other electric signal tests.)

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Frequency weighting / dB		
	A	C	Z	A	C	Z
20	-50.7	-6.6	-0.5	0.1	0.0	0.0
31.5	-39.7	-3.3	-0.3	1.3	-0.1	0.0
63	-26.3	-1.0	-0.1	1.3	-0.6	0.0
125	-16.3	-0.2	-0.1	-1.2	-3.2	0.0
250	-8.7	-0.1	0.0	-11.0	-13.0	0.0
500	-3.2	0.0	0.0	/	/	/

6. Self-generated noise
- Microphone replaced by electrical input signal device

25.9 dB(A)	29.6 dB(C)	36.6 dB(Z)
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7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.0
Rate of the S weighting decrease (dB/s)	4.4
Deviation of F&S	-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

- Reference sound level 90.0 dB
- Max error at 10dB steps upper reference sound level 0.1 dB
- Max error at 10dB steps within 5dB of the upper limit linear operating range 0.0 dB
- Max error at 10dB steps below reference sound level 0.1 dB
- Max error at 10dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB			
	LAFmax-LA	LASmax-LA	LAE-LA	LAeqT-LA
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.2	-26.9	-26.9	-7.0
0.25	-27.1	/	-36.1	-7.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.5	3.5	2.3	2.4	2.3	2.4

11. Overload indication: _Pass

12. Statistical analysis function

- Sweep signal maximum indicated sound level 123.0 dB
- Sweep amplitude 40 dB
- Scan cycle time 60 S
- Measurement period 180 S

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq, T	113.3	113.4	-0.1
L5	121.0	121.0	0.0
L10	119.0	119.0	0.0
L50	103.0	103.0	0.0
L90	87.1	87.0	0.1
L95	85.1	85.0	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions

Air temperature: 20 °C
Relative humidity: 50 %
Static pressure: 101.8 kPa

Test specifications:

- All Scarlet's Sound level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMF P004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests



CERTIFICATE OF CALIBRATION

NO. 20241017162

Name of Product:	Sound Level Meter
Model:	ST-21D
Serial Number:	821037
Specification:	Class 2
Conclusion:	Pass
Date of calibration:	2024-10-17
Due Date:	2025-10-16



- This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpasses then, and applies only to the unit identified above.
- This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

- Preliminary inspection: OK
- Type & serial No. of Microphone: AWA14421A-000650
- Adjustments to indicated sound levels:
Type of Calibrator: B&K 4231
Sound Pressure Level: 94.0 dB
- Measuring up limit: 138 dBA
- Frequency weightings (Acoustic signal tests for Z weighing, other electric signal tests.)

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Frequency weighting / dB		
	A	C	Z	A	C	Z
20	-50.3	-6.1	-0.3	0.0	0.0	0.0
31.5	-39.5	-3.0	-0.1	1.3	-0.1	0.0
63	-26.2	-0.9	0.0	1.2	-0.6	0.0
125	-16.2	-0.2	0.0	-1.2	-3.2	0.0
250	-8.7	0.0	0.0	-11.1	-13.1	0.0
500	-3.2	0.0	0.0	/	/	/

6. Self-generated noise

Microphone replaced by electrical input signal device

24.8 dB(A)	25.6 dB(C)	35.5 dB(Z)
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7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.8
Rate of the S weighting decrease (dB/s)	4.3
Deviation of F&S	-0.1

8. Level Linearity (A-weighting at frequency 1kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.1 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB			
	LAFmax-LA	LASmax-LA	LAE-LA	LAeqT-LA
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.2	-26.9	-26.9	-7.0
0.25	-27.1	/	-36.1	-7.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.5	3.5	2.3	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 123.0 dB

Sweep amplitude: 40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq, T	113.3	113.4	-0.1
L5	121.0	121.0	0.0
L10	119.0	119.0	0.0
L50	103.0	103.0	0.0
L90	87.1	87.0	0.1
L95	85.1	85.0	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions

Air temperature: 20 °C

Relative humidity: 50 %

Static pressure: 101.8 kPa

Test specifications:

1. All Scairlet's Sound Level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMP004-CA-152.
2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
3. The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

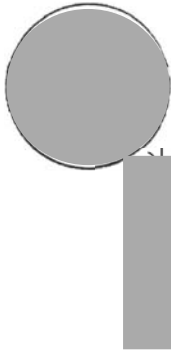
IEC 61672-3 Sound Level Meters Part 3: Periodic tests



CERTIFICATE OF CALIBRATION

NO. 20241017164

Name of Product:	Sound Level Meter
Model:	ST-21D
Serial Number:	821039
Specification:	Class 2
Conclusion:	Pass
Date of calibration:	2024-10-17
Due Date:	2025-10-16



- I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpasses then, and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspection: OK
2. Type & serial No. of Microphone: AWA14421A-0006102
3. Adjustments to indicated sound levels:
Type of Calibrator:B&K 4231
Sound Pressure Level 94.0 dB
4. Measuring up limit: 138.dBA
5. Frequency weightings (Acoustic signal tests for Z weighing, other electric signal tests.)

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
20	-50.4	-6.3	-0.2	1000	0.0	0.0	0.0
31.5	-39.5	-3.1	0.0	2000	1.3	-0.1	0.0
63	-26.3	-0.8	-0.1	4000	1.2	-0.6	0.0
125	-16.2	-0.2	0.0	8000	-1.2	-3.2	0.0
250	-8.7	-0.1	0.0	12500	-11.1	-13.1	0.0
500	-3.3	0.0	0.0	/	/	/	/

6. Self-generated noise
- Microphone replaced by electrical input signal device

25.1 dB(A)	26.3 dB(C)	35.2 dB(Z)
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7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.0
Rate of the S weighting decrease (dB/s)	4.4
Deviation of F&S	-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 10dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.1 dB

Max error at 10dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB		
	LAFmax-LA	LASmax-LA	LAE-LA
500	0.0	-4.0	-2.9
200	-1.0	-7.4	-6.9
2	-18.2	-26.9	-26.9
0.25	-27.1	/	-36.1

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.5	3.5	2.3	2.4	2.3	2.4

11. Overload indication: _Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level 123.0 dB

Sweep amplitude 40 dB

Scan cycle time 60 S; Measurement period 180 S

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq, T	113.3	113.4	-0.1
L5	121.0	121.0	0.0
L10	119.0	119.0	0.0
L50	103.0	103.0	0.0
L90	87.1	87.0	0.1
L95	85.1	85.0	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions

Air temperature: 20 °C
Relative humidity: 50 %
Static pressure: 101.8 kPa

Test specifications:

- All Scarlet's Sound level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMF P004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests



CERTIFICATE OF CALIBRATION

NO. 20241017213

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	821263
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-10-17
Due Date:	2025-10-16

- This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpasses then, and applies only to the unit identified above.
- This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

- Preliminary inspection: OK
- Type & serial No. of Microphone: AWA14425-57213
- Adjustments to indicated sound levels:
Type of Calibrator: B&K 4221 Sound Pressure Level 94.0 dB
- Measuring up limit: 140 dBA
- Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-70.5	-14.5	-0.6	1000	0.0	0.0	0.0
20	-50.2	-6.2	-0.2	2000	1.4	-0.1	0.0
31.5	-39.3	-3.0	-0.1	4000	1.2	-0.7	0.0
63	-26.1	-0.8	0.0	8000	-1.0	-3.0	0.1
125	-16.1	-0.1	0.0	12500	-6.0	-7.9	-0.1
250	-8.6	0.0	0.0	16000	-11.8	-13.8	0.0
500	-3.3	0.0	0.0	20000	-23.8	-25.8	-0.2

6. Self-generated noise

Microphone replaced by electrical input signal device

8.3 dB(A)	8.9 dB(C)	17.4 dB(Z)
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7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.2
Rate of the S weighting decrease (dB/s)	4.3
Deviation of F&S	-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.1 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB			
	LAFmax-LA	LASmax-LA	LAE-LA	LAeqT-LA
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.1	-26.9	-26.9	-7.0
0.25	-27.2	/	-36.0	-7.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.5	3.5	2.4	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level 112.8 dB

Sweep amplitude 40 dB

Scan cycle time 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.2	0.0
L5	110.8	110.8	0.0
L10	108.8	108.8	0.0
L50	92.9	92.8	0.1
L90	76.9	76.8	0.1
L95	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions:

Air temperature: 20 °C

Relative humidity: 50 %

Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2024-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2024-10-15	CIGISMEC
Signal generator	DS 340	33873	2024-10-15	CEPREI

Test specifications:

1. All Scarlett's Sound level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMP004-CA-152.
2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
3. The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests

BEIJING J.T TECHNOLOGY CO., LTD.
www.bjjttec.com
www.jianttech.com



Instrument information

WET BULB GLOBE TEMPERATURE (WBGT) METER

3522311011

JT2011-E2A

MET CO., LTD.

36/659 Moo. 6 Bang Rak Phatthana, Bang Bua Thong

Nonthaburi 11110

Integrity check of instrument

Appearance	✓
Parts integrity	✓
Screen display or touch	✓
Instrument button	✓
Power supply	✓
battery	✓
Data storage and export	✓
Deviation degree of comparison test with standard instrument	✓

Calibration Results

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
WET	25.0	24.8	0.2	0.2
	30.0	29.8	0.2	0.2
	35.0	34.9	0.1	0.2
	40.0	39.9	0.1	0.2
DRY	25.0	44.8	0.2	0.2
	25.0	24.9	0.1	0.2
	30.0	30.2	-0.2	0.2
	35.0	34.9	0.1	0.2
GLOBE	40.0	39.8	0.2	0.2
	45.0	44.9	0.1	0.2
	25.0	25.2	-0.2	0.2
	30.0	30.2	-0.2	0.2
GLOBE	35.0	34.9	0.1	0.2
	40.0	39.9	0.1	0.2
	45.0	44.9	0.1	0.2

environmental conditions: $26^{\circ}\text{C} \pm 2^{\circ}\text{C}$, relative humidity: $30\% \text{ RH} \pm 10\text{RH}\%$

Reference Standard : Standard Mercury Thermometers, Manufacturer: BGRI, Model: STA, SN : 2-56,
Calibrated Date : 20 February 2024, Calibration Certificate No. : RA21H-AB1000009

This Certificate is traceable to NCMT North China. Certificate No.: BA201-AK00000000
Calibrated Date : 20 February 2024; Calibration Certificate NO.: NQZ-III-AD-1619

Calibration Engineer :

Date: _____ Oct _____

Instrument information



WET BULB GLOBE TEMPERATURE (WBGT) METER

Name	3522311012
Series No	JT2011-E2A
Type	MET CO., LTD.
Customer	36/659 Moo. 6 Bang Rak Phatthana, Bang Bua Thong
Address	Nonthaburi 11110
Integrity check of instrument	
Appearance	✓
Parts integrity	✓
Screen display or touch	✓
Instrument button	✓
Power supply	✓
battery	✓
Data storage and export	✓
Deviation degree of comparison test with standard instrument	✓

Calibration Results

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
WET	25.0	25.1	-0.1	0.2
	30.0	30.1	-0.1	0.2
	35.0	35.1	-0.1	0.2
	40.0	39.8	0.2	0.2
DRY	45.0	45.1	-0.1	0.2
	25.0	24.8	0.2	0.2
	30.0	29.9	0.1	0.2
	35.0	34.8	0.2	0.2
GLOBE	40.0	40.1	-0.1	0.2
	45.0	44.8	0.2	0.2
	25.0	25.2	-0.2	0.2
	30.0	29.9	0.1	0.2
	35.0	34.8	0.2	0.2
	40.0	40.2	-0.2	0.2
	45.0	44.9	0.1	0.2

Environmental conditions: temperature: 26 °C ± 2 °C, relative humidity: 30% RH ± 10 RH%
Reference Standard : Standard Mercury Thermometers, Manufacturer: BGRI, Model: STA, SN : 2-56,
Calibrated Date : 20 February 2024, Calibration Certificate No. : RA21H-AB1000009
This Certificate is traceable to NCMT North China, Certificate No.: RA20J-AK0000000

Calibration Engineer :

Date : October



CALIBRATION CERTIFICATE



Certificate No. : L202405093-0001
Date Issued : 13-May-24

Customer : MET CO., LTD.
36/659 Moo 6 T. Bangrakpattana A. Bangbuatong Nonthaburi 11110

Equipment : Heat Stress Meter

Manufacturer : JANTYTECH

Model : JT2011-E2A

Serial No. : 3522210537

ID No./Tag No. : -

Date Received : 09-May-24

Date Calibrated : 10-May-24

Calibrated by : Mr. Apiwat Pearnungrot

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.



Approved by:

Page 1 of 2

Certificate No. : L202405093-0001

Environment : Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15)%RH

STD	UUC Reading (°C)	UUC Error	Measurement	MPE	Pass / Fail
Reading (°C)	Before Adjusted	After Adjusted	Uncertainty (±°C)	(±°C)	Simple Acceptance
23.97	WET 24.0	-	0.03	0.38	0.5
23.97	DRY 23.8	-	-0.17	0.38	0.5
23.97	GLOBE 24.0	-	0.03	0.35	0.5
29.99	WET 30.2	-	0.21	0.38	0.5
29.99	DRY 30.0	-	0.01	0.38	0.5
29.99	GLOBE 30.1	-	0.11	0.35	0.5
40.00	WET 40.3	-	0.30	0.38	0.5
40.00	DRY 40.0	-	0.00	0.38	0.5
40.00	GLOBE 40.2	-	0.20	0.35	0.5

STD = Standard
UUC = Unit Under Calibration

Pass = |error| ≤ |MPE|
Fail = |error| > |MPE|

Description of UUC : Range 0 to 120 °C
Resolution 0.1 °C

Condition As-Received : Used Item
The measurement results and statements of conformity with specification only relate to the item calibrated.
Measurement Standards Used & Traceability :

The International System of Units (SI) through
MIT Certificate No. L202310317-0003 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 06-Nov-24

End of Certificate

CALIBRATION CERTIFICATE



Certificate No. : L202405093-0003
Date Issued : 13-May-24

Customer : MET CO.,LTD.
36/659 Moo 6 T. Bangrakpattana A.Bangbuatong Nonthaburi 11110

Equipment : Heat Stress Meter

Manufacturer : JANTYTECH
Model : JT2011-E2A
Serial No. : 3522210538

ID No./Tag No. : -
Date Received : 09-May-24
Date Calibrated : 10-May-24

Calibrated by : Mr. Apiwat Peannungrot

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.



Approved by:



Certificate No. :

L202405093-0003

Environment :

Ambient Temperature :

(25 ± 2) °C

Relative Humidity :

(50 ± 15)%RH

STD	UUC Reading (°C)	UUC Error	Measurement	MPE	Pass / Fail
Reading (°C)	Before Adjusted	After Adjusted	Uncertainty (±°C)	(±°C)	Simple Acceptance
23.97	WET 23.8	-	0.35	0.5	Pass
23.97	DRY 23.9	-	0.35	0.5	Pass
23.97	GLOBE 23.9	-	0.41	0.5	Pass
29.99	WET 29.8	-	0.35	0.5	Pass
29.99	DRY 29.8	-	0.35	0.5	Pass
29.99	GLOBE 29.7	-	0.41	0.5	Pass
40.00	WET 40.4	-	0.35	0.5	Pass
40.00	DRY 40.1	-	0.35	0.5	Pass
40.00	GLOBE 39.7	-	0.41	0.5	Pass

STD = Standard

UUC = Unit Under Calibration

Pass = |error| ≤ |MPE|

Fail = |error| > |MPE|

Description of UUC :

Range

0 to 120 °C

Resolution

0.1 °C

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202310317-0003 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 06-Nov-24

End of Certificate

CALIBRATION CERTIFICATE



Certificate No. : L202405093-0002

Date Issued : 13-May-24

Customer

: MET CO.,LTD.

36/659 Moo 6 T. Bangrakpattana A.Bangbuatong Nonthaburi 11110

Equipment

: Heat Stress Meter

Manufacturer

: JANTYTECH

Model

: JT2011-E2A

Serial No.

: 3522210539

ID No./Tag No.

: -

Date Received

: 09-May-24

Date Calibrated

: 10-May-24

Calibrated by

: Mr. Apiwat Peanrungrat

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.



Approved by



Certificate No. : L202405093-0002

Environment : Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15)%RH

STD	UUC Reading (°C)	UUC Error	Measurement	MPE	Pass / Fail
Reading (°C)	Before Adjusted	After Adjusted	Uncertainty (±°C)	(±°C)	Simple Acceptance
23.97	WET 23.8	-	0.38	0.5	Pass
23.97	DRY 23.8	-	0.41	0.5	Pass
23.97	GLOBE 23.9	-	0.38	0.5	Pass
29.99	WET 30.0	-	0.38	0.5	Pass
29.99	DRY 29.6	-	0.41	0.5	Pass
29.99	GLOBE 30.1	-	0.38	0.5	Pass
40.00	WET 40.1	-	0.38	0.5	Pass
40.00	DRY 39.6	-	0.41	0.5	Pass
40.00	GLOBE 40.2	-	0.38	0.5	Pass

STD = Standard
UUC = Unit Under Calibration

Pass = |error| ≤ |MPE|
Fail = |error| > |MPE|

Description of UUC : Range 0 to 120 °C
Resolution 0.1 °C

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202310317-0003 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 06-Nov-24

End of Certificate



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD
214 Bangwaek Rd. Bangnai Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Certificate No. : L202501086-0001

Date Issued : 16-Jan-25

Customer : MET CO.,LTD.
36/659 Moo 6 T. Bangrakpattana A.Bangbuatong Nonthaburi 11110

Equipment : Heat Stress Meter

Manufacturer : Metrosonic

Model : hs-32

Serial No. : MCE010018

ID No./Tag No. : -

Date Received : 09-Jan-25

Date Calibrated : 13-Jan-25

Calibrated by : Apiwat Peanrungronth

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

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

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by:



Approved by _____

Certificate No. : L202501219-00001

Environment : Ambient Temperature : (25 ± 2) °C
Relative Humidity : (50 ± 15)%RH

STD	UUC Reading (°C)		UUC Error (°C)	Measurement Uncertainty (±°C)
	Before Adjusted	After Adjusted		
24.00	WET 24.1	-	0.10	0.35
27.98	DRY 27.9	-	-0.08	0.35
29.99	GLOBE 29.9	-	-0.09	0.47
26.98	WET 27.0	-	0.02	0.35
31.98	DRY 32.0	-	0.02	0.35
35.00	GLOBE 35.2	-	0.20	0.47
29.98	WET 29.9	-	-0.08	0.35
35.99	DRY 36.0	-	0.01	0.35
39.98	GLOBE 40.2	-	0.22	0.47

Description of UUC : Range (-5) to 100 °C
Resolution 0.1 °C

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202411001-0001 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 04-Nov-25

End of Certificate

