

ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือฯ

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

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

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



Certificate of Calibration

Certificate No. STCR-2307040-4

Work Order No. STCR-2307040

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Light Meter
Manufacturer : EXTECH
Model : 407026
Serial Number : A.056643
Control Number : LH-02-016
Received Date : Jul 20, 2023
Calibration Date : Jul 21, 2023
Recommended Due Date : Jul 21, 2024
Calibration Method : Calibration Procedure No. CPP-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Jul 21, 2023

Calibrated by : A. Somchai

Approved by :



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2307040-4

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Standard Light Meter	210801715	551220085467676	Nov 11, 2023	ANAB : AC-1969

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2307040-4

Page 3 of 3

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

Appearance and Function of Use Inspection : GOOD

Luminance Accuracy Test

Unit : Lux

Range	STD. Value	UUC. Reading	Correction	(±) Uncertainty
2000	25.00	26	-1	2.3
	200.00	197	3	11
	1000.00	996	4	44
	1800.00	1783	17	79
20000	2000.00	1980	20	88
	3000.00	2860	140	132
	5000.00	4670	330	220

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



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Certificate of Calibration

Certificate No. STCR-2303048-18**Work Order No.** STCR-2303048

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Sound Level Meter
Manufacturer : Scarlet Tech
Model : ST-25D
Serial Number : 10340893
Control Number : NS-09-004
Received Date : Mar 25, 2023
Calibration Date : Mar 27, 2023
Recommended Due Date : Mar 27, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
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5. This results of this report only to the items calibrated.

Date of Issue : Mar 30, 2023

Approved by :

Calibrated by : S. Sompoch



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-18

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-18

Page 3 of 3

UUC Range : (28 to 133) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
Auto	94.07 dB	97.1 dB	94.1 dB	-0.03 dB	0.40 dB
	114.05 dB	116.9 dB	113.8 dB	0.25 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
Auto	94.07 dB	97.1 dB	94.1 dB	-0.03 dB	0.40 dB
	114.05 dB	116.9 dB	113.8 dB	0.25 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



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

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Certificate of Calibration

Certificate No. STCR-2303048-19

Work Order No. STCR-2303048

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Sound Level Meter
Manufacturer : Scarlet Tech
Model : ST-25D
Serial Number : 10340894
Control Number : NS-09-005
Received Date : Mar 25, 2023
Calibration Date : Mar 27, 2023
Recommended Due Date : Mar 27, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
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5. This results of this report only to the items calibrated.

Date of Issue : Mar 30, 2023

Approved by :

Calibrated by : S. Sompoch



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-19

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Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-19

Page 3 of 3

UUC Range : (28 to 133) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
Auto	94.07 dB	95.5 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	115.3 dB	113.9 dB	0.15 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
Auto	94.07 dB	95.5 dB	94.1 dB	-0.03 dB	0.40 dB
	114.05 dB	115.3 dB	113.9 dB	0.15 dB	0.40 dB

STD = Standard

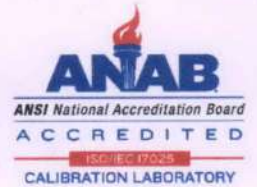
UUC = Unit Under Calibration

- End of Certificate -



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

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Certificate of Calibration

Certificate No. STCR-2303048-20**Work Order No. STCR-2303048**

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Sound Level Meter
Manufacturer : Scarlet Tech
Model : ST-25D
Serial Number : 10340895
Control Number : NS-09-006
Received Date : Mar 25, 2023
Calibration Date : Mar 27, 2023
Recommended Due Date : Mar 27, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
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5. This results of this report only to the items calibrated.

Date of Issue : Mar 30, 2023

Approved by :

Calibrated by : S. Sompoch

(Mr. Mayut Wongwong)
Laboratory Manager



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-20

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Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-20

Page 3 of 3

UUC Range : (28 to 133) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
Auto	94.07 dB	95.2 dB	93.9 dB	0.17 dB	0.40 dB
	114.05 dB	115.0 dB	113.8 dB	0.25 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
Auto	94.07 dB	95.2 dB	93.9 dB	0.17 dB	0.40 dB
	114.05 dB	115.0 dB	113.8 dB	0.25 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



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

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Certificate of Calibration

Certificate No. STCR-2303048-21**Work Order No.** STCR-2303048

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Sound Level Meter
Manufacturer : Scarlet Tech
Model : ST-25D
Serial Number : 10340896
Control Number : NS-09-007
Received Date : Mar 25, 2023
Calibration Date : Mar 27, 2023
Recommended Due Date : Mar 27, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
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5. This results of this report only to the items calibrated.

Date of Issue : Mar 30, 2023

Approved by :

Calibrated by : S. Sompoch



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-21

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-21

Page 3 of 3

UUC Range : (28 to 133) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
Auto	94.07 dB	93.5 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	113.2 dB	113.8 dB	0.25 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
Auto	94.07 dB	93.5 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	113.2 dB	113.8 dB	0.25 dB	0.40 dB

STD = Standard

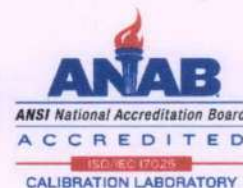
UUC = Unit Under Calibration

- End of Certificate -



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

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Certificate of Calibration

Certificate No. STCR-2303048-22**Work Order No.** STCR-2303048

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Sound Level Meter
Manufacturer : Scarlet Tech
Model : ST-25D
Serial Number : 10340897
Control Number : NS-09-008
Received Date : Mar 25, 2023
Calibration Date : Mar 27, 2023
Recommended Due Date : Mar 27, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
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5. This results of this report only to the items calibrated.

Date of Issue : Mar 30, 2023

Approved by :

Calibrated by : S. Sompoch



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-22

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-22

Page 3 of 3

UUC Range : (28 to 133) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
Auto	94.07 dB	93.6 dB	94.1 dB	-0.03 dB	0.40 dB
	114.05 dB	113.4 dB	113.9 dB	0.15 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
Auto	94.07 dB	93.6 dB	94.1 dB	-0.03 dB	0.40 dB
	114.05 dB	113.4 dB	113.9 dB	0.15 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



CERTIFICATE OF CALIBRATION

Certificate No. : 66S0420-22

Job No. : 66S0420

Page : 1 of 2

Customer : C.E.M Technology (Thailand) Co.,Ltd.

Address : 31/8 Moo 13, Raikhing, Samphran,
Nakhornpathom 73210

Location : Laboratory

Equipment : Sound Level Meter

Ambient temperature : $(20 \pm 2) ^\circ\text{C}$

Manufacturer : ACO

Relative humidity : $(50 \pm 15) \%$

Model : 6236

Atmospheric pressure : -

Serial No. : 222188

Date of received : 30-Mar-2023

Identity No. : NS-03-018

Date of calibration : 03-Apr-2023

Range : See to Data

Date of issued : 05-Apr-2023

Calibration Method : This instrument was calibrated by comparison measurement with sound level calibrator, according to in house calibration method.

Reference Standard Instruments :

Equipment	Model	Serial No.	Certification No.	Due Date
Sound Level Calibrator	8930B	2000210	EEL.BP.31/0664	15-Jun-2023

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

Calibrated By : Mr. Boonyarit Auejirakarn

Approved By :

Reviewed By : ☐ Mr. Sompong Srisert

☒ Ms. Bhacharin Phanangkaew (MD)

☒ Ms. Natthaparakarn Thammaphan

☐ Mr. Boonyarit Auejirakarn

Result of Calibration : Without Adjustment

Function : Sound Level Measurement

Calibration Range : @ 1 kHz

Resolution : 0.1 dB / 1 dB

Response	Standard Setting (dB)	UUC Reading (dB)	Error Value (dB)	Uncertainty (+/-dB)
A	94	94.0	0.0	0.20
	104	104.0	0.0	0.20
	114	113.9	-0.1	0.20
B	94	94.0	0.0	0.20
	104	103.9	-0.1	0.20
	114	113.8	-0.2	0.20
Z	94	94.0	0.0	0.20
	104	103.9	-0.1	0.20
	114	113.9	-0.1	0.20

UUC = Unit Under Calibration*

- The End -

CERTIFICATE OF CALIBRATION

Certificate No. : 66S0420-24

Job No. : 66S0420

Page : 1 of 2

Customer : C.E.M Technology (Thailand) Co.,Ltd.

Address : 31/8 Moo 13, Raikhing, Samphran,
Nakhornpathom 73210

Location : Laboratory

Equipment : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial No. : 222193

Identity No. : NS-03-023

Range : See to Data

Ambient temperature : (20 ± 2) °C

Relative humidity : (50 ± 15) %

Atmospheric pressure : -

Date of received : 30-Mar-2023

Date of calibration : 03-Apr-2023

Date of issued : 05-Apr-2023

Calibration Method : This instrument was calibrated by comparison measurement with sound level calibrator, according to in house calibration method.

Reference Standard Instruments :

Equipment	Model	Serial No.	Certification No.	Due Date
Sound Level Calibrator	8930B	2000210	EEL.BP.31/0664	15-Jun-2023

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

Calibrated By : Mr. Boonyarit Auejirakarn

Approved By :

Reviewed By : [] Mr. Sompong Srisert

[x] Ms. Natthaparakarn Thammaphan

[] Ms. Bhacharin Phanangkaew (MD)

[x] Mr. Boonyarit Auejirakarn

Result of Calibration : Without Adjustment

Function : Sound Level Measurement

Calibration Range : @ 1 kHz

Resolution : 0.1 dB / 1 dB

Response	Standard Setting (dB)	UUC Reading (dB)	Error Value (dB)	Uncertainty (+/-dB)
A	94	93.8	-0.2	0.20
	104	103.8	-0.2	0.20
	114	113.8	-0.2	0.20
B	94	93.8	-0.2	0.20
	104	103.8	-0.2	0.20
	114	113.8	-0.2	0.20
Z	94	93.8	-0.2	0.20
	104	103.8	-0.2	0.20
	114	113.8	-0.2	0.20

UUC = Unit Under Calibration*

- The End -

CERTIFICATE OF CALIBRATION

Certificate No. : 66S0420-21

Job No. : 66S0420

Page : 1 of 2

Customer : C.E.M Technology (Thailand) Co.,Ltd.

Address : 31/8 Moo 13, Raikhing, Samphran,
Nakhornpathom 73210

Location : Laboratory

Equipment : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial No. : 222191

Identity No. : NS-03-021

Range : See to Data

Ambient temperature : $(20 \pm 2) ^\circ\text{C}$ Relative humidity : $(50 \pm 15) \%$

Atmospheric pressure : -

Date of received : 30-Mar-2023

Date of calibration : 03-Apr-2023

Date of issued : 05-Apr-2023

Calibration Method : This instrument was calibrated by comparison measurement with sound level calibrator, according to in house calibration method.

Reference Standard Instruments :

Equipment	Model	Serial No.	Certification No.	Due Date
Sound Level Calibrator	8930B	2000210	EEL.BP.31/0664	15-Jun-2023

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

Calibrated By : Mr. Boonyarit Auejirakarn

Approved By : 

[] Ms. Bhacharin Phanangkaew (MD)

Reviewed By : [] Mr. Sompong Srisert

[] Mr. Boonyarit Auejirakarn

[☒] Ms. Natthaparakarn Thammaphan

Result of Calibration : Without Adjustment

Function : Sound Level Measurement

Calibration Range : @ 1 kHz

Resolution : 0.1 dB / 1 dB

Response	Standard Setting (dB)	UUC Reading (dB)	Error Value (dB)	Uncertainty (+/-dB)
A	94	94.2	0.2	0.20
	104	104.2	0.2	0.20
	114	114.2	0.2	0.20
B	94	94.2	0.2	0.20
	104	104.2	0.2	0.20
	114	114.2	0.2	0.20
Z	94	94.2	0.2	0.20
	104	104.2	0.2	0.20
	114	114.2	0.2	0.20

UUC = Unit Under Calibration*

- The End -

CERTIFICATE OF CALIBRATION

Certificate No. : 66S0420-23

Job No. : 66S0420

Page : 1 of 2

Customer : C.E.M Technology (Thailand) Co.,Ltd.

Address : 31/8 Moo 13, Raikhing, Samphran,
Nakhornpathom 73210

Location : Laboratory

Equipment : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial No. : 222192

Identity No. : NS-03-022

Range : See to Data

Ambient temperature : (20 ± 2) °C

Relative humidity : (50 ± 15) %

Atmospheric pressure : -

Date of received : 30-Mar-2023

Date of calibration : 03-Apr-2023

Date of issued : 05-Apr-2023

Calibration Method : This instrument was calibrated by comparison measurement with sound level calibrator, according to in house calibration method.

Reference Standard Instruments :

Equipment	Model	Serial No.	Certification No.	Due Date
Sound Level Calibrator	8930B	2000210	EEL.BP.31/0664	15-Jun-2023

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

Calibrated By : Mr. Boonyarit Auejirakarn

Approved By :

Reviewed By : [] Mr. Sompong Srisert

[] Ms. Natthaparakarn Thammaphan

[] Ms. Bhacharin Phanangkaew (MD)

[] Mr. Boonyarit Auejirakarn

Result of Calibration : Without Adjustment

Function : Sound Level Measurement

Calibration Range : @ 1 kHz

Resolution : 0.1 dB / 1 dB

Response	Standard Setting (dB)	UUC Reading (dB)	Error Value (dB)	Uncertainty (+/-dB)
A	94	93.9	-0.1	0.20
	104	103.9	-0.1	0.20
	114	114.0	0.0	0.20
B	94	93.9	-0.1	0.20
	104	103.9	-0.1	0.20
	114	113.9	-0.1	0.20
Z	94	93.9	-0.1	0.20
	104	103.9	-0.1	0.20
	114	114.0	0.0	0.20

UUC = Unit Under Calibration*

- The End -

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

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THANYABURI, PATHUM THANI 12110, THAILAND

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Certificate of Calibration

Certificate No. STCR-2305061-3

Work Order No. STCR-2305061

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Sound Level Meter
Manufacturer : Scarlet Tech
Model : ST-25D
Serial Number : 10340902
Control Number : NS-09-013
Received Date : May 30, 2023
Calibration Date : May 30, 2023
Recommended Due Date : May 30, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Jun 1, 2023

Approved by :

Calibrated by : M. Thippatai



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2305061-3

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2305061-3

Page 3 of 3

UUC Range : (28 to 133) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
Auto	94.07 dB	92.2 dB	93.8 dB	0.27 dB	0.40 dB
	114.05 dB	111.9 dB	113.6 dB	0.45 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
Auto	94.07 dB	92.3 dB	93.9 dB	0.17 dB	0.40 dB
	114.05 dB	111.9 dB	113.6 dB	0.45 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



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Certificate of Calibration

Certificate No. STCR-2305061-4

Work Order No. STCR-2305061

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Sound Level Meter
Manufacturer : Scarlet Tech
Model : ST-25D
Serial Number : 10340903
Control Number : NS-09-014
Received Date : May 30, 2023
Calibration Date : May 30, 2023
Recommended Due Date : May 30, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Jun 1, 2023

Approved by :

Calibrated by : M. Thippatai



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2305061-4

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2305061-4

Page 3 of 3

UUC Range : (28 to 133) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
Auto	94.07 dB	96.7 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	116.8 dB	113.9 dB	0.15 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
Auto	94.07 dB	96.7 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	116.8 dB	114.0 dB	0.05 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



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Certificate of Calibration

Certificate No. STCR-2307040-9

Work Order No. STCR-2307040

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Sound Level Meter
Manufacturer : Scarlet Tech
Model : ST-25D
Serial Number : 10340900
Control Number : SN-09-011
Received Date : Jul 20, 2023
Calibration Date : Jul 21, 2023
Recommended Due Date : Jul 21, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
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Date of Issue : Jul 21, 2023

Calibrated by : S. Sompoch

Approved by :



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2307040-9

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2307040-9

Page 3 of 3

UUC Range : (28 to 133) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	94.0 dB	-	0.07 dB	0.40 dB
	114.05 dB	113.9 dB	-	0.15 dB	0.40 dB
SLOW	94.07 dB	94.0 dB	-	0.07 dB	0.40 dB
	114.05 dB	113.9 dB	-	0.15 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	94.0 dB	-	0.07 dB	0.40 dB
	114.05 dB	113.9 dB	-	0.15 dB	0.40 dB
SLOW	94.07 dB	94.0 dB	-	0.07 dB	0.40 dB
	114.05 dB	113.9 dB	-	0.15 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



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Certificate of Calibration

Certificate No. STCR-2307040-10

Work Order No. STCR-2307040

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Sound Level Meter
Manufacturer : Scarlet Tech
Model : ST-25D
Serial Number : 10340901
Control Number : NS-09-012
Received Date : Jul 20, 2023
Calibration Date : Jul 21, 2023
Recommended Due Date : Jul 21, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Jul 21, 2023

Approved by :

Calibrated by : S. Sompoch



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2307040-10

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2307040-10

Page 3 of 3

UUC Range : (28 to 133) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	86.3 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	106.5 dB	114.1 dB	-0.05 dB	0.40 dB
SLOW	94.07 dB	86.3 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	106.4 dB	114.1 dB	-0.05 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	86.6 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	107.2 dB	114.1 dB	-0.05 dB	0.40 dB
SLOW	94.07 dB	86.7 dB	94.1 dB	-0.03 dB	0.40 dB
	114.05 dB	107.2 dB	114.1 dB	-0.05 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

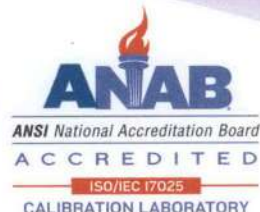
- End of Certificate -





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Certificate of Calibration

Certificate No. STCR-2302027-6

Work Order No. STCR-2302027

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Village No.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Noise Dose Meter
Manufacturer : SOUNDTEK
Model : ST-130
Serial Number : 220100180
Control Number : NS-06-012
Received Date : Feb 18, 2023
Calibration Date : Feb 20, 2023
Recommended Due Date : Feb 20, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Feb 24, 2023

Calibrated by : M. Thippatai

Approved by :

(Mr. Chayut Wongleang)
Laboratory Manager

Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2302027-6

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2302027-6

Page 3 of 3

UUC Range : (30 to 140) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	92.8 dB	94.0 dB	0.07 dB	0.40 dB
SLOW	94.07 dB	92.7 dB	94.0 dB	0.07 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	92.9 dB	94.0 dB	0.07 dB	0.40 dB
SLOW	94.07 dB	92.9 dB	94.0 dB	0.07 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

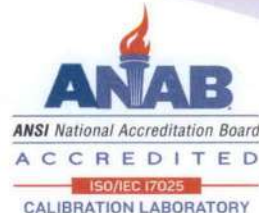
- End of Certificate -



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

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Certificate of Calibration

Certificate No. STCR-2302027-7

Work Order No. STCR-2302027

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Village No.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Noise Dose Meter
Manufacturer : SOUNDTEK
Model : ST-130
Serial Number : 220100189
Control Number : NS-06-013
Received Date : Feb 18, 2023
Calibration Date : Feb 20, 2023
Recommended Due Date : Feb 20, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Feb 24, 2023

Calibrated by : M. Thippatai

Approved by :

(Mr.Chayut Wongleang)
Laboratory Manager

Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2302027-7

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2302027-7

Page 3 of 3

UUC Range : (30 to 140) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	93.1 dB	94.0 dB	0.07 dB	0.40 dB
SLOW	94.07 dB	93.1 dB	94.1 dB	-0.03 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	93.2 dB	94.0 dB	0.07 dB	0.40 dB
SLOW	94.07 dB	93.2 dB	94.1 dB	-0.03 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

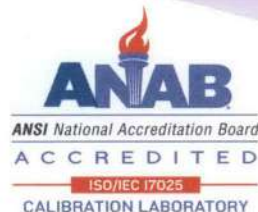
- End of Certificate -





SMART TECH CALIBRATION & SERVICES CO., LTD.

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Certificate of Calibration

Certificate No. SCCR-2302027-8

Work Order No. SCCR-2302027

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Village No.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Noise Dose Meter
Manufacturer : SOUNDTEK
Model : ST-130
Serial Number : 220100197
Control Number : NS-06-014
Received Date : Feb 18, 2023
Calibration Date : Feb 20, 2023
Recommended Due Date : Feb 20, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Feb 24, 2023

Calibrated by : M. Thippatai

Approved by :



(Mr.Chayut Wongleang)
Laboratory Manager

Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2302027-8

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2302027-8

Page 3 of 3

UUC Range : (30 to 140) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	93.9 dB	94.0 dB	0.07 dB	0.40 dB
SLOW	94.07 dB	93.9 dB	94.0 dB	0.07 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	96.8 dB	94.0 dB	0.07 dB	0.40 dB
SLOW	94.07 dB	96.8 dB	94.0 dB	0.07 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



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

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

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



Certificate of Calibration

Certificate No. STCR-2303048-5

Work Order No. STCR-2303048

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Noise Dose Meter
Manufacturer : SOUNDTEK
Model : ST-130
Serial Number : 220100022
Control Number : NS-06-021
Received Date : Mar 25, 2023
Calibration Date : Mar 27, 2023
Recommended Due Date : Mar 27, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Mar 30, 2023

Approved by :

Calibrated by : S. Sompoch



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-5

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-5

Page 3 of 3

UUC Range : (30 to 140) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	92.8 dB	94.0 dB	0.07 dB	0.40 dB
SLOW	94.07 dB	92.8 dB	94.0 dB	0.07 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	92.8 dB	94.1 dB	-0.03 dB	0.40 dB
SLOW	94.07 dB	92.8 dB	94.1 dB	-0.03 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



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

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Certificate of Calibration

Certificate No. STCR-2303048-6

Work Order No. STCR-2303048

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Noise Dose Meter
Manufacturer : SOUNDTEK
Model : ST-130
Serial Number : 220100033
Control Number : NS-06-022
Received Date : Mar 25, 2023
Calibration Date : Mar 27, 2023
Recommended Due Date : Mar 27, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Mar 30, 2023

Approved by :

Calibrated by : S. Sompoch



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-6

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-6

Page 3 of 3

UUC Range : (30 to 140) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	92.5 dB	93.9 dB	0.17 dB	0.40 dB
SLOW	94.07 dB	92.5 dB	93.9 dB	0.17 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	92.5 dB	93.9 dB	0.17 dB	0.40 dB
SLOW	94.07 dB	92.5 dB	93.9 dB	0.17 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



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

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Certificate of Calibration

Certificate No. STCR-2303048-7**Work Order No.** STCR-2303048

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Noise Dose Meter
Manufacturer : SOUNDTEK
Model : ST-130
Serial Number : 220100034
Control Number : NS-06-023
Received Date : Mar 25, 2023
Calibration Date : Mar 27, 2023
Recommended Due Date : Mar 27, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Mar 30, 2023

Approved by :

Calibrated by : S. Sompoch



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-7

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-7

Page 3 of 3

UUC Range : (30 to 140) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	92.3 dB	94.0 dB	0.07 dB	0.40 dB
SLOW	94.07 dB	92.3 dB	93.9 dB	0.17 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	92.3 dB	94.0 dB	0.07 dB	0.40 dB
SLOW	94.07 dB	92.3 dB	93.9 dB	0.17 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



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

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Certificate of Calibration

Certificate No. STCR-2303048-8

Work Order No. STCR-2303048

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Noise Dose Meter
Manufacturer : SOUNDTEK
Model : ST-130
Serial Number : 220100035
Control Number : NS-06-024
Received Date : Mar 25, 2023
Calibration Date : Mar 27, 2023
Recommended Due Date : Mar 27, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Mar 30, 2023

Approved by :

Calibrated by : S. Sompoch



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-8

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-8

Page 3 of 3

UUC Range : (30 to 140) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	91.5 dB	94.0 dB	0.07 dB	0.40 dB
SLOW	94.07 dB	91.5 dB	93.9 dB	0.17 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	91.5 dB	94.0 dB	0.07 dB	0.40 dB
SLOW	94.07 dB	91.5 dB	93.9 dB	0.17 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



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

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Certificate of Calibration

Certificate No. STCR-2303048-9**Work Order No.** STCR-2303048

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Noise Dose Meter
Manufacturer : SOUNDTEK
Model : ST-130
Serial Number : 220100036
Control Number : NS-06-025
Received Date : Mar 25, 2023
Calibration Date : Mar 27, 2023
Recommended Due Date : Mar 27, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Mar 30, 2023

Approved by :

Calibrated by : S. Sompoch



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-9

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-9

Page 3 of 3

UUC Range : (30 to 140) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	92.1 dB	94.1 dB	-0.03 dB	0.40 dB
SLOW	94.07 dB	92.2 dB	94.1 dB	-0.03 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	92.2 dB	94.1 dB	-0.03 dB	0.40 dB
SLOW	94.07 dB	92.2 dB	94.1 dB	-0.03 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



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

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Certificate of Calibration

Certificate No. STCR-2303048-10

Work Order No. STCR-2303048

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Noise Dose Meter
Manufacturer : SOUNDTEK
Model : ST-130
Serial Number : 220100037
Control Number : NS-06-026
Received Date : Mar 25, 2023
Calibration Date : Mar 27, 2023
Recommended Due Date : Mar 27, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Mar 30, 2023

Approved by :

Calibrated by : S. Sompoch



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-10

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-10

Page 3 of 3

UUC Range : (30 to 140) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	89.9 dB	94.0 dB	0.07 dB	0.40 dB
SLOW	94.07 dB	89.9 dB	94.0 dB	0.07 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	89.9 dB	94.0 dB	0.07 dB	0.40 dB
SLOW	94.07 dB	89.9 dB	94.0 dB	0.07 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



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

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Certificate of Calibration

Certificate No. STCR-2303048-27

Work Order No. STCR-2303048

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Village No.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Heat Stress Monitor
Manufacturer : JANTYTECH
Model : JT2011-E2
Serial Number : 352221460
Control Number : HT-03-026
Received Date : Mar 25, 2023
Calibration Date : Mar 29, 2023
Recommended Due Date : Mar 29, 2024
Calibration Method : Calibration Procedure No. CPT-04-11

Environmental Conditions

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

Condition as received : Normal
Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Mar 30, 2023

Approved by :

Calibrated by : A. Somchai

(Mr. Chayut Wongleang)
Laboratory Manager



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-27

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Reference Thermometer Readout	250220030008	TMU222996	Aug 19, 2023	ANAB : AC-2658
Secondary Reference PRT	04794	TMU222996	Aug 19, 2023	ANAB : AC-2658
Temperature and Humidity Standard	LA-00002148	551220085487524	Nov 18, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-27

Page 3 of 3

Results of Calibration

1. Temperature measurement (WET)

STD Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
15.018	15.1	-0.082	0.20
25.013	25.0	0.013	0.20
40.016	40.0	0.016	0.20

2. Temperature measurement (DRY)

STD Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
15.018	15.0	0.018	0.20
25.013	25.0	0.013	0.20
40.016	40.0	0.016	0.20

STD = Standard

UUC = Unit Under Calibration

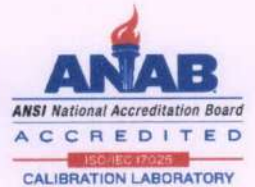
- End of Certificate -



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Certificate of Calibration

Certificate No. STCR-2303048-28

Work Order No. STCR-2303048

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Village No.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Heat Stress Monitor
Manufacturer : JANTYTECH
Model : JT2011-E2
Serial Number : 352221461
Control Number : HT-03-027
Received Date : Mar 25, 2023
Calibration Date : Mar 29, 2023
Recommended Due Date : Mar 29, 2024
Calibration Method : Calibration Procedure No. CPT-04-11

Environmental Conditions

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

Condition as received : Normal
Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Mar 30, 2023

Calibrated by : A. Somchai

Approved by :

(Mr. Chayut Wongleang)
Laboratory Manager



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Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-28

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Reference Thermometer Readout	250220030008	TMU222996	Aug 19, 2023	ANAB : AC-2658
Secondary Reference PRT	04794	TMU222996	Aug 19, 2023	ANAB : AC-2658
Temperature and Humidity Standard	LA-00002148	551220085487524	Nov 18, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-28

Page 3 of 3

Results of Calibration

1. Temperature measurement (WET)

STD Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
15.021	15.0	0.021	0.20
25.019	25.0	0.019	0.20
40.016	40.0	0.016	0.20

2. Temperature measurement (DRY)

STD Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
15.021	15.0	0.021	0.20
25.019	25.0	0.019	0.20
40.016	40.1	-0.084	0.20

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



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

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

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



Certificate of Calibration

Certificate No. STCR-2303048-29

Work Order No. STCR-2303048

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Village No.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Heat Stress Monitor
Manufacturer : JANTYTECH
Model : JT2011-E2
Serial Number : 352221462
Control Number : HT-03-028
Received Date : Mar 25, 2023
Calibration Date : Mar 29, 2023
Recommended Due Date : Mar 29, 2024
Calibration Method : Calibration Procedure No. CPT-04-11

Environmental Conditions

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

Condition as received : Normal
Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Mar 30, 2023

Approved by :

Calibrated by : A. Somchai



@smarttechcal

Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-29

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Reference Thermometer Readout	250220030008	TMU222996	Aug 19, 2023	ANAB : AC-2658
Secondary Reference PRT	04794	TMU222996	Aug 19, 2023	ANAB : AC-2658
Temperature and Humidity Standard	LA-00002148	551220085487524	Nov 18, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2303048-29

Page 3 of 3

Results of Calibration

1. Temperature measurement (WET)

STD Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
15.013	15.0	0.013	0.20
25.019	25.0	0.019	0.20
40.027	40.0	0.027	0.20

2. Temperature measurement (DRY)

STD Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
15.013	15.0	0.013	0.20
25.020	25.0	0.020	0.20
40.027	40.0	0.052	0.20

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-67/0020

MTC.No.23-67/0020-02

Number of page(s) 2

CALIBRATION CERTIFICATE

Nomenclature : DRYCAL

Manufacturer : BIOS International Corporation, USA.

Serial No.: 102591

Model : DCL-H

Scale range : 500 ml/min to 30 l/min

Subdivision : (0.0001, 0.001, 0.01) l/min

Submitted by : C.E.M.TECHNOLOGY (THAILAND) CO.,LTD.

31/8 Moo 13 , Raikhing, Samphran,

Nakhornpathom 73210, Thailand.

Received date : 6 October 2023

Condition of measured item : Normal

Calibration date : 2 November 2023

Standard :

Standard	Certificate No.	Date due	Traceability
RTD Thermometer	PSL-T 643/65	1-Jun-24	TISTR
Molbox/Pressure Transducer/UpStream	MP-0076-23	2-Apr-25	NIMT
Primary Flow Calibrator S/N 119521	MW-0033-23	6-Jun-25	NIMT
Primary Flow Calibrator S/N 119216	MW-0035-23	31-May-25	NIMT

Calibrated by :

Terasak Panna

(Mr.Terasak Panna)

Approved by :

Kirana Luanghirun

(Ms.Kirana Luanghirun)

Director

Mechanical Engineering Standards Laboratory

Ref. 2013266100603986002

Issued Date 7 November 2023

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

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FM.BL.MTC.002 Rev.4

Head Office

35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,
Changwat Pathumthani 12120, Thailand

Tel. (66) 0 2577 9000

Fax. (66) 0 2577 9009

E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,
Amphoe Muang, Changwat Samutprakan 10280, Thailand

Tel. (66) 0 2323 1672-80 ext. 115, 116

Fax. (66) 0 2323 9165

E-mail : mtc@tistr.or.th

Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,
Thailand

Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-67/0020

2/2

MTC.No.23-67/0020-02

Calibration point : (0.5, 1, 2, 5, 20) l/min

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

Atmospheric pressure (1010 ± 13) hPa

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

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

Measurement data :

UUC Value (l/min)	Standard Value (l/min)	Temperature (°C)	Pressure (hPa)	Deviation (%)	Uncertainty (%)
0.5012	0.49751	24.849	1008.69	+0.75	0.87
1.014	1.0110	24.865	1008.76	+0.30	0.86
2.019	2.0139	24.808	1009.04	+0.27	0.86
5.025	5.0066	24.823	1009.63	+0.38	0.86
20.05	19.954	24.854	1014.53	+0.48	0.98

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

The end of calibration certificate.

T/S.

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-67/0020

MTC.No.23-67/0020-01

Number of page(s) 2

CALIBRATION CERTIFICATE

Nomenclature : DRYCAL

Manufacturer : BIOS International Corporation, USA.

Serial No.: 108158

Model : DCL-ML

Scale range : 50 ml/min to 2 l/min

Subdivision : (0.0001, 0.001, 0.01) l/min

Submitted by : C.E.M.TECHNOLOGY (THAILAND) CO.,LTD.

31/8 Moo 13 , Raikhing, Samphran,
Nakhornpathom 73210, Thailand.

Received date : 6 October 2023

Condition of measured item : Normal

Calibration date : 1 November 2023

Standard :

Standard	Certificate No.	Date due	Traceability
RTD Thermometer	PSL-T 643/65	1-Jun-24	TISTR
Molbox/PressureTransducer/UpStream	MP-0076-23	2-Apr-25	NIMT
Primary Flow Calibrator S/N 117982	MW-0034-23	11-Jun-25	NIMT
Primary Flow Calibrator S/N 119521	MW-0033-23	6-Jun-25	NIMT

Calibrated by : Terasak Panna

(Mr.Terasak Panna)

Approved by :

(Ms.Kirana Luanghirun)

Director

Mechanical Engineering Standards Laboratory

Ref. 2013266100603986001

Issued Date 7 November 2023

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Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-67/0020

2/2

MTC.No.23-67/0020-01

Calibration point : (0.05, 0.1, 0.2, 1, 2) l/min

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

Atmospheric pressure (1010 ± 13) hPa

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

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

Measurement data :

UUC Value (l/min)	Standard Value (l/min)	Temperature (°C)	Pressure (hPa)	Deviation (%)	Uncertainty (%)
0.0509	0.048870	24.850	1008.36	+4.16	1.00
0.1027	0.10016	24.851	1008.31	+2.54	1.00
0.2094	0.20688	24.730	1006.58	+1.20	1.00
1.009	1.0012	24.679	1006.77	+0.78	0.86
2.035	2.0198	24.542	1006.93	+0.73	0.86

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

The end of calibration certificate.

Tb.

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Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

Certificate of Calibration

EQUIPMENT : ION SPECIFIC ELECTRODE
MANUFACTURER : HEWETT PACKARD
MODEL : ISE
SERIAL No. : 16290
RECEIVED DATE : December 20, 2022
CALIBRATED DATE : December 21, 2022
EXPIRY DATE : December 19, 2023

1. CALIBRATION

1.1 OPTICAL : CHECK THAT PMT EHT IS WITHIN THE NORMAL OPERATING RANGE FOR SELECTED HC LAMP
FOR COPPER AT 324.5 nm, 4 mA, 0.5 nm SLIT WIDTH, EHT = 246.6V.

1.2 ANALYTICAL PERFORMANCE

1.2.1 STANDARD SOLUTION COPPER FROM HIGHT- PURITY STANDARD CHEM SERVICE CO.,LTD.

1.2.2 CONDITLONS

POSITIIVE ION : 26.19 nm

FUEL FLOW RATE (ACETYLENE) : 1.8 l/min

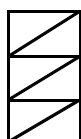
NEGATIVE ION : 28.30 nm

OXIDANT FLOW RATE (AIR) : 12.3 l/min

CONCENTRATION (ppm)	SPECIFICATION (ABS)	READ (ABS)	REMARK
1	≥ 0.08	0.144	PASS
3	≥ 0.26	0.420	PASS
5	≥ 0.48	0.704	PASS

2. CHECK

INTERLOCK AND MICRO SWITCHES



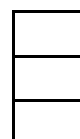
PASS

EXTERNAL OPTICAL SURFACES

PASS

SENSITIVITY

PASS

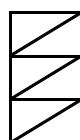


FAIL

FAIL

FAIL

3. CLEAN & CHANGE



CHANGE O-RINGS AND SEALS IN THE SPRAY CHAMBER.

CLEAN THE SPRAY CHAMBER, LIQUID TRAP.

CLEAN EXTERNAL OPTICAL SURFACES.

This report certificates that all calibration equipment used in the test is traceable to Quest supervision and calibration procedure and applies only to the unit under EQUIPMENT above.

This report must not be reproduced except in its without the written approval of Science and Technology calibration (ASIA)., PTE (HONGKONG) / 15 Austin Avenue, THT Kowloon, Hongkong. Tel./Fax 852-23115225

Calibrated by Lee David
(Lee David. Technical Engineer)



THAI CALIBRATION SERVICES CO., LTD.

19/8 Moo 9 Soi Raiking 30 Puttamonthon 5 Rd., Sampran, Nakhon Pathom 73210

Tel. 0-3439-7682-5 Fax: 0-3439-7687

www.thaical.com E-mail : sale@thaicalibration.com, lab@thaicalibration.com



CALIBRATION CERTIFICATE

Certificate No.S2302120S

page 1 of 2

Customer : C.E.M. TECHNOLOGY (THAILAND) CO., LTD.
31/8 Moo 13 Raikhing,
Samphran, Nakhorn Pathom 73210

Equipment : Non-automatic weighing instrument (Electronic instrument)

Manufacturer : Ohaus Corporation **Order No. :** 66S0459-1

Model : NV4101/2 **Ambient temperature :** $(26.3 \pm 5.0) ^\circ\text{C}$

Accuracy class : - **Relative humidity :** $(47.0 \pm 10.0) \%$

Capacity : 4100 g **Received date :** 06-Feb-2023

Resolution : 0.2 g **Date of calibration :** 06-Feb-2023

Serial No. : 8334016068 **Date of issue :** 08-Feb-2023

ID No. : ST-03-001 **Condition of the balance :** Good working conditions

Place of calibration : ห้องประชุม

Calibration method

This instrument was calibrated according to the EURAMET Calibration Guide No. 18.

Condition of reference standard weight

Instrument	Nominal value	Serial No.	Certificate No.	Due-date	Density (kg/m ³)
1 Standard weight set	50 mg to 20 kg	-	M2203001S	5-Mar-2023	7950

Traceability of the reference standard weight

This certificate is traceable to SI unit through Mass Calibration Laboratory Thai Calibration Services Co., Ltd., NSC-ONSC accredited no. Calibration 0189.

Calibrated By :


Sathaporn Rueangpluppla
Technician

Approved By :


Chonlatee Pongwatvisanon
Approved Signatory

This calibration certificate may not be reproduced other than in full,
except with the prior written approval of the head of TCS calibration laboratory.



THAI CALIBRATION SERVICES CO., LTD.

19/8 Moo 9 Soi Raiking 30 Puttamonthon 5 Rd., Sampran, Nakornpatom 73210

Tel. 0-3439-7682-5 Fax: 0-3439-7687

www.thaical.com E-mail : sale@thaicalibration.com, lab@thaicalibration.com



NSC-TISI-TIS 17025
CALIBRATION 0189

CALIBRATION CERTIFICATE

Certificate No.S2302120S

page 2 of 2

The repeatability of indication

Nominal Value (g)	Standard Deviation of reading (g)	Maximum difference between successive reading (g)	n
4000	0.00	0.0	5

The effect of eccentric application of a load on the indication (test load : 2000 g)

Position	Balance Reading (g)
Point 1	2000.0
Point 2	2000.0
Point 3	1999.8
Point 4	2000.0
Point 5	2000.0
Eccentric Value	0.2

3	4
2	5

The error of indication

Nominal Value (g)	Value of Reference Standard Weight (g)	Balance Reading (g)	Correction (g)	Uncertainty (±) (g)	k
Unload	0.0	0.0	0.0	0.17	2.00
400	400.0	400.0	0.0	0.17	2.00
800	800.0	800.0	0.0	0.17	2.00
1200	1200.0	1200.0	0.0	0.18	2.00
1600	1600.0	1600.0	0.0	0.19	2.00
2000	2000.0	2000.0	0.0	0.21	2.00
2400	2400.0	2400.0	0.0	0.22	2.00
2800	2800.0	2800.0	0.0	0.23	2.00
3200	3200.0	3200.0	0.0	0.25	2.00
3600	3600.0	3600.0	0.0	0.27	2.00
4100	4100.0	4100.0	0.0	0.29	2.00

Remark : Adjustment, External weight nominal value 2000 g, Standard weight of Lab

Uncertainty of measurement

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor (k), which for a normal distribution corresponds to a coverage probability of approximately 95% (confidence level).

This report will certify of the calibrated equipment only.

--End--



CERTIFICATE OF System Validation

This certificate was provided by Amani Corporation limited. To certifies that the instruments referenced below have passed system Validation tests and complies with the requirements of the specified set of test

Validation Package Number : TR2022001

Instruments : GC

Model : KONIK GC 4000B

Serial No : 4B1774

Location : C.E.M. Technology (Thailand) Co., Ltd.



Amani Corporation Limited

Service Engineer : _____

(Teerapon Tawonwong)



December 21, 2022



Calibration Result

Instruments Information			
Calibration Package Number		TR2022001	
Instruments Type		Gas Chromatograph	
Serial Number	4B1774	Model	KONIK GC 4000B
Installation Date		End of Warranty	
S.O. Number		P.O. Number	
Firmware Version		DPFC Rom Ver.	
Left Injection	-	Right Injector	S/SL
Left DPFC	-	Right DPFC	-
Left Detector	-	Right Detector	FID
Left DGFC	-	Right DGFC	-
Auxiliary Detector	-	Valve/Valve Oven	-
Last Validation	December 21,2022	Next Validation	December 21,2023
Last Preventive Maintenance	December 21,2022	Next Preventive Maintenance	December 21,2023
Data System Type	N2000	Data System Version	3.1.1

Gases Information			
Injector			
Left Carrier	-	Right Carrier	Helium,3.0mL/min
Detector			
Left Detector	-	Right Detector	FID
Gas 1	-	Gas 1(Hydrogen)	Hydrogen,40mL/min
Gas 2	-	Gas 2 (Make-up)	Nitrogen,30mL/min
Gas 3	-	Gas 3 (Air)	Air Zero, 350mL/min

Service Engineer Signature:

(Teerapon Tawonwong)

Date:

21.12.2022



Gases Flow Rate Validation Result

Carrier Gases

Set point (mL/min)	Measured (mL/min)	Criteria (mL/min)	Status
25	25.0	24.0-26.0	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Fail

Detector Gases

Reference Gas

Set point (mL/min)	Measured (mL/min)	Criteria (mL/min)	Status
Low 9	9.3	8.0-12.0	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Fail
High 50	46.7	45.0-55.0	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Fail

Make-up Gas

Set point (mL/min)	Measured (mL/min)	Criteria (mL/min)	Status
Low 9	9.7	8.0-12.0	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Fail
High 30	31.3	28.0-32.0	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Fail

Service Engineer Signature:

(Teerapon Tawonwong)

Date:

21.12.2022



Temperature Validation Result

Injector Temperature

Set point (° C)	Measured (° C)	Status	Note
60 +/- 1.0	60.0	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Fail	

Detector Temperature

Block Temp			
Set point (° C)	Measured (° C)	Status	Note
60 +/- 1.0	60.0	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Fail	
Transfer Temp			
Set point (° C)	Measured (° C)	Status	Note
60 +/- 1.0	60.0	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Fail	

Column Oven

Set point (° C)	Measured (° C)	Status	Note
40 +/- 1	40.0	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Fail	RTD OFFSET = 6.2
120 +/- 1	120.0	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Fail	

Service Engineer Signature:

Teerapong Tawonwong

(Teerapong Tawonwong)



Date:

21.12.2022

บริษัท อามานี คอร์ปอเรชั่น จำกัด
Amani Corporation Limited

Parts Referenced

Part	Description	Note
Analytical Column	Capillary Column RTX-5 Film : 0.25 um Length : 7 Meter Diameter : 0.32 mmID	Reference With : Restek
Standard Sample	FID Performance Evaluation Sample Kit	Manufactured By Agilent Technologies. 5080-8842 Lot: 0006604151
Sample Injection	Syringe 10 ul	Manufactured By SGE




Service Engineer Signature:


 (Teerapon Tawonwong)

Date:

21.12.2022


 บริษัท อามานี คอร์ปอเรชั่น จำกัด
 Amani Corporation Limited

Operating Condition

Parameter	Condition
Environmental	Temperature 25.0 °C Relative Humidity 45.7 °C
Instrument Condition	Gases <ul style="list-style-type: none">- Carrier Gas : Helium = 1ml/min- Hydrogen = 35 ml/min- Air = 350 ml/min- Make-up Gas: Nitrogen = 30ml/min Oven <ul style="list-style-type: none">- Initial Temperature = 50°C- Initial Time = 1 minute- Ramp 1 = 20 °C/minute- Final Temperature = 200°C- Final Time = 1 minute Injector <ul style="list-style-type: none">- Operating Mode = Spilt- Temperature = 230 °C- Split Flow 40 ml/min- Purge Flow rate = 5 ml/min Detector <ul style="list-style-type: none">- Base Temperature = 250 °C- Detector Signal Range = 10° Injected Volume <ul style="list-style-type: none">- 1 µl + needle of Test Mixture

Service Engineer Signature:



(Teerapon Tawonwong)



Date:

21.12.2022

บริษัท อามานี จำกัด
Amani Corporation Limited

CERTIFICATE OF CALIBRATION

Certificate No. : 66S0929-1

Job No. : 66S0929

Page : 1 of 2

Customer : C.E.M. Technology (Thailand) Co.,Ltd.

Address : 31/8 Moo 13, Raikhing, Samphran,
Nakhornpathom 73210

Location : Laboratory

Equipment : Sound Level Meter

Ambient temperature : $(20 \pm 2) ^\circ\text{C}$

Manufacturer : BSWA Tech

Relative humidity : $(50 \pm 15) \%$

Model : BSWA 309

Atmospheric pressure : -

Serial No. : 590102

Date of received : 11-Sep-2023

Identity No. : NS-04-003

Date of calibration : 14-Sep-2023

Range : See to Data

Date of issued : 18-Sep-2023

Calibration Method : This instrument was calibrated by comparison measurement with sound level calibrator, according to in house calibration method.

Reference Standard Instruments :

Equipment	Model	Serial No.	Certification No.	Due Date
Sound Level Calibrator	8930B	2000210	EEL.BP.40/0666	21-Jun-2025

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

Calibrated By : Mr. Boonyarit Auejirakarn

Approved By :

Reviewed By : ☐ Mr. Sompong Srisert

☒ Ms. Bhacharin Phanangkaew (MD)

☒ Ms. Natthaparakarn Thammaphan

☒ Mr. Boonyarit Auejirakarn

Result of Calibration : Without Adjustment

Function : Sound Level Measurement

Calibration Range : @ 1 kHz

Resolution : 0.1 dB / 1 dB

Response	Standard Setting (dB)	UUC Reading (dB)	Error Value (dB)	Uncertainty (+/-dB)
A	94	94.0	0.0	0.20
	104	103.9	-0.1	0.20
	114	113.9	-0.1	0.20
B	94	94.0	0.0	0.20
	104	103.9	-0.1	0.20
	114	113.9	-0.1	0.20
Z	94	94.1	0.1	0.20
	104	104.1	0.1	0.20
	114	114.0	0.0	0.20

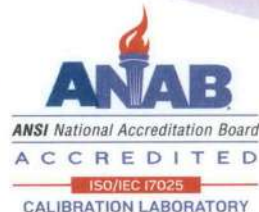
UUC = Unit Under Calibration*

- The End -

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

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

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



Certificate of Calibration

Certificate No. STCR-2302027-13

Work Order No. STCR-2302027

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Village No.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Sound Level Meter
Manufacturer : pulsar
Model : 44
Serial Number : PN2362
Control Number : NS-08-004
Received Date : Feb 18, 2023
Calibration Date : Feb 20, 2023
Recommended Due Date : Feb 20, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
5. This results of this report only to the items calibrated.

Date of Issue : Feb 24, 2023

Calibrated by : M. Thippatai

Approved by :



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2302027-13

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969.20

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2302027-13

Page 3 of 3

UUC Range : (20 to 140) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	95.1 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	115.0 dB	114.0 dB	0.05 dB	0.40 dB
SLOW	94.07 dB	95.2 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	115.0 dB	113.9 dB	0.15 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



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Certificate of Calibration

Certificate No. STCR-2307040-1

Work Order No. STCR-2307040

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Sound Level Meter
Manufacturer : pulsar
Model : 44
Serial Number : PN2308
Control Number : NS-08-002
Received Date : Jul 20, 2023
Calibration Date : Jul 21, 2023
Recommended Due Date : Jul 21, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

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

Condition as received : Normal

Calibration Result : See data attached

1. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
2. The Unit Under Calibration (UUC) has been calibrated by using the working standard which is traceable to SI-Units. The calibration procedure documented is intended to implement the requirements of ISO/IEC 17025 : 2017
3. The working standard is indicated in page 2 of this certificate.
4. This report applies to the item calibrated and shall not be reproduced except in full, without written approval by Calibration Laboratory, Smart Tech Calibration & Services Co.,Ltd.
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Date of Issue : Jul 21, 2023

Approved by :

Calibrated by : S. Sompoch

(Mr.Chayut Wongleang)
Laboratory Manager



@smarttechcal

Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2307040-1

Page 2 of 3

Standards Equipment Used

<u>Equipment Name</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>	<u>Traceability to</u>
Sound Calibrator	N975186	551220085447862	Nov 2, 2023	ANAB : AC-1969

Traceability

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

- ANAB : The ANSI National Accreditation Bord.



Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2307040-1

Page 3 of 3

UUC Range : (20 to 140) dB

Resolution : 0.1 dB

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

Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz

Select : A

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	93.3 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	113.1 dB	113.9 dB	0.15 dB	0.40 dB
SLOW	94.07 dB	93.3 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	113.2 dB	113.9 dB	0.15 dB	0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	93.4 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	113.2 dB	114.0 dB	0.05 dB	0.40 dB
SLOW	94.07 dB	93.3 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	113.2 dB	113.9 dB	0.15 dB	0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0026

MTC No. EEL. BP. 60/1065

CALIBRATION CERTIFICATE

Submitted by : C.E.M. TECHNOLOGY (THAILAND) CO., LTD.
Address : 31/8 Moo 13, Raikhing, Samphran, Nakhornpathom, 73210
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

Instrument Calibrated :

Ambient Environment

Description	: Sound Level Meter	Temperature	: $(23 \pm 3) ^\circ\text{C}$
Manufacturer	: Pulsar	Relative Humidity	: $(50 \pm 15) \%$
Model	: 44	Ambient Pressure	: $(101.325 \pm 1.5) \text{ kPa}$
Serial No.	: PN2367		
Microphone	: PM2 022488E		
Preamplifier	: PA40 2321		

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2633526.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 11 Oct. 2022

Date of Calibration : 8 Nov. 2022

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9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.
10. Speaker Tannoy Limited, Great Britain British Patent No. 215300.
11. Digital Multimeter Agilent 34401A S/N MY44005560.
12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2013). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

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

Date of Calibration : 8 Nov. 2022

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Request No. 21-66/0026

MTC No. EEL. BP. 60/1065

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value(dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	Before adjust	After adjust				
93.70	93.8	93.7	0.0	1.0	0.48	N/A

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 93.7 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
17.4	0.10	N/A

2.2 The microphone of the sound level meter was replaced by electrical signal input device

Frequency Weighting	Measured value (dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-Weight	under-range	-	N/A
C-Weight	19.2	0.10	N/A
Flat	29.1	0.10	N/A

Note: The under-range means that the indicator cannot display for setting the range of 20-140 dB.

Date of Calibration : 8 Nov. 2022

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3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
125	0.1	0.2	0.1	1.5	0.45	0.6
1 000	-0.5	-0.6	-0.5	1.0	0.45	0.6
8 000	-0.9	-0.7	-1.0	5.0	0.45	0.7

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response curve(dB)			Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight	Flat			
63	0.2	0.0	0.0	2.0	0.20	0.6
125	0.0	0.0	0.0	1.5	0.20	0.6
250	0.0	0.0	0.0	1.5	0.20	0.6
500	0.0	0.0	0.0	1.5	0.20	0.6
1 000	0.0	0.0	0.0	1.0	0.20	0.6
2 000	0.1	0.0	0.0	2.0	0.20	0.6
4 000	0.1	0.1	0.0	3.0	0.20	0.6
8 000	0.4	0.4	0.2	5.0	0.20	0.7

Date of Calibration : 8 Nov. 2022

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5. Long-term stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Begin	94.0	0.0	0.3	0.10	0.1
End	94.0				

6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.0	0.0	0.2	0.20	0.2

6.2 Time weightings at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Fast	94.0	0.0	0.1	0.20	0.2
Slow	94.0	0.0	0.1	0.20	0.2
Leq	94.0	0.0	0.1	0.20	0.2

Date of Calibration : 8 Nov. 2022

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Request No. 21-66/0026

MTC No. EEL. BP. 60/1065

7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
139	139.0	0.0	1.1	0.30	0.3
138	138.0	0.0	1.1	0.30	0.3
137	137.0	0.0	1.1	0.30	0.3
136	136.0	0.0	1.1	0.30	0.3
135	135.0	0.0	1.1	0.30	0.3
134	134.0	0.0	1.1	0.30	0.3
129	129.0	0.0	1.1	0.30	0.3
124	124.0	0.0	1.1	0.30	0.3
119	119.0	0.0	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	89.2	0.2	1.1	0.30	0.3
84	84.1	0.1	1.1	0.30	0.3
79	79.0	0.0	1.1	0.30	0.3
74	74.0	0.0	1.1	0.30	0.3
69	69.0	0.0	1.1	0.30	0.3
64	64.0	0.0	1.1	0.30	0.3
59	59.0	0.0	1.1	0.30	0.3

Date of Calibration : 8 Nov. 2022

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MTC No. EEL. BP. 60/1065

7. Level linearity on the reference level range (cont.)

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
54	54.0	0.0	1.1	0.30	0.3
49	49.0	0.0	1.1	0.30	0.3
44	44.0	0.0	1.1	0.30	0.3
39	39.0	0.0	1.1	0.30	0.3
34	34.0	0.0	1.1	0.30	0.3
29	29.0	0.0	1.1	0.30	0.3
24	24.1	0.1	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
20-140	94	94.0	0.0	1.1	0.30	0.3

Date of Calibration : 8 Nov. 2022

7 / 9

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8. Level linearity including the level range control

At reference level at 5 dB greater than the under-range on a level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(\pm dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
20-140	25	25.0	0.0	1.1	0.30	0.3

9. Tone burst response

Time Weighting	Toneburst Duration, Tb(ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(dB)	Uncertainty (\pm dB)	Maximum-permitted uncertainty of measurement (\pm dB)
Fast	200	136.0	0.0	± 1.0	0.20	0.3
	2	118.8	-0.2	+1.0; -2.5	0.20	0.3
	0.25	109.8	-0.2	+1.5; -5.0	0.20	0.3
Slow	200	129.6	0.0	± 1.0	0.20	0.3
	2	110.0	0.0	+1.0; -5.0	0.20	0.3
SEL	200	130.0	0.0	± 1.0	0.20	0.3
	2	110.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	100.9	-0.1	+1.5; -5.0	0.20	0.3

Date of Calibration : 8 Nov. 2022

8 / 9

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

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

Wu

FM.BL.MTC.002 Rev.4

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Thailand

Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217

Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0026

MTC No. EEL. BP. 60/1065

10. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Complete cycle	135.4	135.2	-0.2	3.0	0.20	0.35
Positive half cycle	134.4	134.2	-0.2	2.0	0.20	0.35
Negative half cycle	134.4	134.2	-0.2	2.0	0.20	0.35

11. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limit class 2(±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Positive one-half cycle	Negative one-half cycle				
139.4	139.4	0.0	2.0	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
Begin	139.0	0.0	0.3	0.10	0.1
End	139.0				

Calibrated by :

Wittawat Supanich

(Mr. Wittawat Supanich)

Approved by :

Prawate Kluaypa
for (Mr. Prawate Kluaypa)
Director

TISTR
Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 8 Nov. 2022

Date of Issue : 10 Nov. 2022

Ref : 2011265101104401007

End of Certificate

9 / 9

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

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FM.BL.MTC.002 Rev.4

Head Office

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E-mail : mtc@tistr.or.th

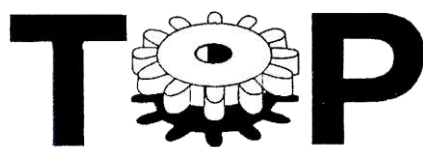
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Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th



Trade & Engineering

**TSP High Volume Sampler
TE-5000 TSP Sampler Verification
Site Information**

Location: -	Site ID: -	Date: 16 Oct 23
Sampler: TE-5000 TSP	Serial No: 3269	Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 27.80	Corrected Pressure (mm Hg): 706.1
Temperature (deg F): 76.1	Temperature (deg K): 297.7
Average Press. (in Hg): 27.30	Corrected Average (mm Hg): 693.4
Average Temp (Deg F): 75.0	Average Temp: (Deg K): 297.0

Calibration Orifice

Make: Tisch	Qstd Slope: 1.58304
Model: TE-5028A	Qstd Intercept: -0.01520
Serial#: 1179	Calibration Due Date 12 December 2023

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	7.50	1.678	59.7	57.58	Slope: 35.4041
2	6.30	1.539	55.4	53.43	Intercept: -2.1709
3	5.20	1.399	47.9	46.20	Corr. Coeff: 0.9834
4	4.50	1.302	43.7	42.15	
5	3.10	1.112	40.1	38.68	
					# of Observations: 5

Calculations

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$
$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

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

m = sampler slope

b = sampler intercept

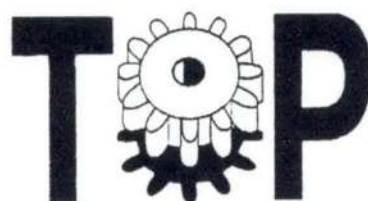
I = chart response

Tav = daily average temperature

Pav = daily average pressure

Enter Average I (chart):	49.4
Average Flow Calculation m3/min	1.395189676
Average Flow Calculation in cfm	49.26517152
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	2009.073133
Total flow in 24 hours cfm	70941.84699

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



Trade & Engineering

PM10 High Volume Sampler Verification

Site Information

Location: - Site ID: -
Sampler: TE-6070 PM10 Serial No: 1313

Date: 10 January 2023
Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 28.10
Temperature (deg F): 76.2
Average Press. (in Hg): 27.00
Average Temp. (deg F): 75.4

Corrected Pressure (mm Hg): 713.7
Temperature (deg K): 297.6
Corrected Average (mm Hg): 685.8
Average Temp. (deg K): 297.1

Calibration Orifice

Make: Tisch Environmental, Inc.
Model: TE-5028A
Serial#: 1179

Qstd Slope: 1.58304
Qstd Intercept: -0.01520
Calibration Due Date: 12 Dec 23

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	8.80	1.220	59.9	38.68	Slope 33.6928
2	7.00	1.089	54.9	35.45	Intercept -1.8198
3	5.80	0.992	49.9	32.22	Corr. Coeff 0.9945
4	5.00	0.922	44.8	28.93	SFR 1.087
5	3.80	0.805	38.7	24.99	SSP 53.92

of Observations: 5

Calculations

$$Qa = 1/m(\text{Sqrt}((H2O)(Ta/Pa))-b)$$
$$IC = I(\text{Sqrt}(Ta/Pa))$$

$$SFR = 1.13(Ps/Pa)(Ta/Ts)$$
$$SSP = (m*SFR+b)(\text{Sqrt}(Pa/Ta))$$

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

Qa = actual flow rate
IC = corrected chart response
m = calibrator slope
b = calibrator intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
For subsequent calculation
of sampler flow:

SFR = sampler set point flow rate
SSP = sampler chart set point
m = sampler slope
b = sampler intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
Ts = Average temperature (deg K)
Ps = Average pressure (mm Hg)

Average I(chart): 34.5
Average Flow over Sample (m3/min)
0.727985358
Enter Total Time (Hrs): 24.0
Total flow over sample (m3/min)
1048.298915
Total flow over sample (CFM)
37015.43469

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

Certificate of Analyzer Performance Testing

Calibrated Date : 5-Aug-23

Certificate No. : 0823-001

Page : 1/1

Analyzer Instruments

Analyzer Type : SO2 Analyzer

Manufacturer : Thermo Environmental

Model : 43C

Serial No. : 43C-62201-334

Environmental

Temperature : 25.0 °C

Humidity : 51.9 %RH

Calibration System

Calibrator Units

Gas Calibration : Thermo Environmental

Zero Air Generator : API

Model : 146C

Model : 701

Serial No. : 514811458

Serial No. : 179

Standard Gas

NO Conc. : 2 ppm

Cylinder No. : CC750227

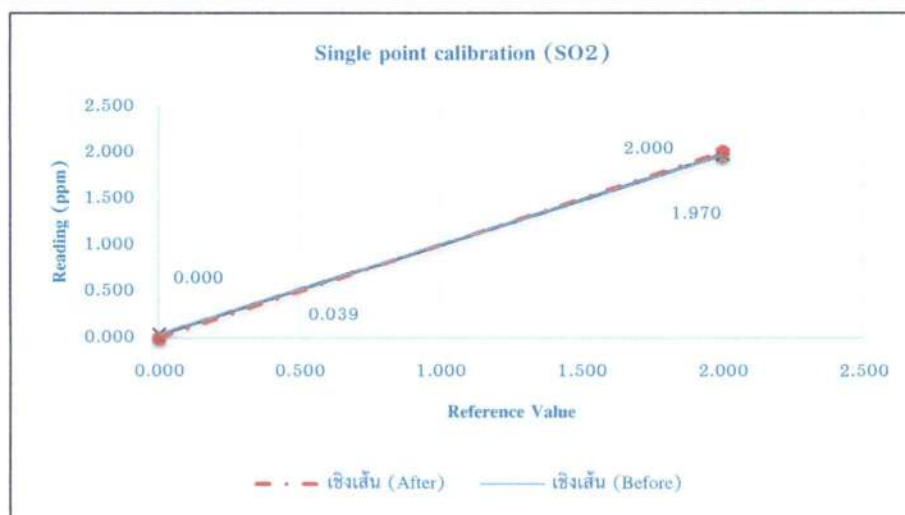
SO2 Conc. : 2 ppm

Expire Date : 21-Nov-23

CO Conc. : 50 ppm

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
SO2	0.039	0.000	0.04	1.97	2.000	-1.50
After						
SO2	0.000	0.000	0.00	2.00	2.000	0.00



Calibrated by :


 (Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 11-Mar-23

Certificate No. : 0323-003

Page : 1/1

Analyzer Instruments

Analyzer Type : NO/NO_x Analyzer
Model : 42C

Manufacturer : Thermo Environmental
Serial No. : 58926-320

Environmental

Temperature : 24.3 °C
Humidity : 51.4 %RH

Calibration System

Calibrator Units

Gas Calibration : Thermo Environmental
Model : 146C
Serial No. : 514811458

Zero Air Generator : API
Model : 701
Serial No. : 179

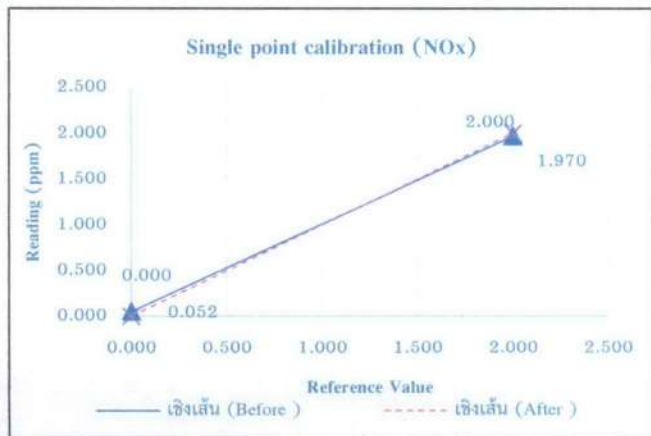
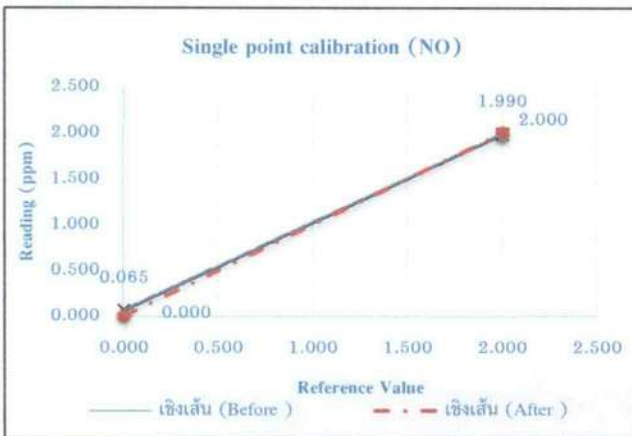
Standard Gas

NO Conc. : 2 ppm
SO₂ : 2 ppm
CO Conc. : 50 ppm

Cylinder No. : CC750227
Expire Date : 21-Nov-23

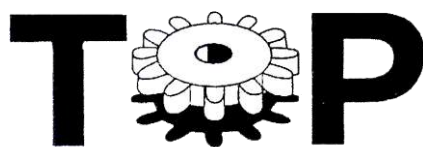
Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
NO	0.065	0.000	0.07	1.99	2.00	-0.50
NO _x	0.052	0.000	0.05	1.97	2.00	-1.50
After						
NO	0.000	0.000	0.00	2.00	2.00	0.00
NO _x	0.000	0.000	0.00	2.00	2.00	0.00



Calibrated by :

Tong Piima
(Mr. Tong Piima)



Trade & Engineering

**TSP High Volume Sampler
TE-5000 TSP Sampler Verification
Site Information**

Location: -	Site ID: -	Date: 16 Oct 23
Sampler: TE-5000 TSP	Serial No: 3270	Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 27.60	Corrected Pressure (mm Hg): 701.0
Temperature (deg F): 76.0	Temperature (deg K): 297.6
Average Press. (in Hg): 27.50	Corrected Average (mm Hg): 698.5
Average Temp (Deg F): 74.8	Average Temp: (Deg K): 296.9

Calibration Orifice

Make: Tisch	Qstd Slope: 1.58304
Model: TE-5028A	Qstd Intercept: -0.01520
Serial#: 1179	Calibration Due Date 12 December 2023

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	7.80	1.705	60.1	57.76	Slope: 28.1557
2	6.00	1.497	57.2	54.97	Intercept: 11.0629
3	5.30	1.407	53.4	51.32	Corr. Coeff: 0.9717
4	4.50	1.297	49.7	47.77	
5	3.90	1.209	45.6	43.83	
					# of Observations: 5

Calculations

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$
$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

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

m = sampler slope

b = sampler intercept

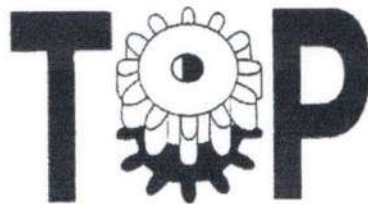
I = chart response

Tav = daily average temperature

Pav = daily average pressure

Enter Average I (chart):	53.2
Average Flow Calculation m3/min	1.421779972
Average Flow Calculation in cfm	50.2040944
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	2047.36316
Total flow in 24 hours cfm	72293.89593

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



Trade & Engineering

PM10 High Volume Sampler Verification

Site Information

Location: -

Site ID: -

Date: 10 January 2023

Sampler: TE-6070 PM10

Serial No: 1239

Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 27.00

Temperature (deg F): 75.6

Average Press. (in Hg): 26.50

Average Temp. (deg F): 75.2

Corrected Pressure (mm Hg): 685.8

Temperature (deg K): 297.2

Corrected Average (mm Hg): 673.1

Average Temp. (deg K): 297.0

Calibration Orifice

Make: Tisch Environmental, Inc.

Model: TE-5028A

Serial#: 1179

Qstd Slope: 1.58304

Qstd Intercept: -0.01520

Calibration Due Date: 12 Dec 23

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	8.60	1.229	59.7	39.30	Slope 33.1155
2	6.80	1.094	54.7	36.01	Intercept -0.8080
3	5.60	0.994	49.7	32.72	Corr. Coeff 0.9947
4	4.80	0.921	44.6	29.36	SFR 1.110
5	3.60	0.799	38.5	25.35	SSP 54.60

of Observations: 5

Calculations

$$Qa = 1/m(\text{Sqrt}((H2O)(Ta/Pa))-b)$$

$$IC = I(\text{Sqrt}(Ta/Pa))$$

$$SFR = 1.13(Ps/Pa)(Ta/Ts)$$

$$SSP = (m*SFR+b)(\text{Sqrt}(Pa/Ta))$$

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

Qa = actual flow rate

IC = corrected chart response

m = calibrator slope

b = calibrator intercept

Ta = actual temperature (deg K)

Pa = actual pressure (mm Hg)

For subsequent calculation

of sampler flow:

SFR = sampler set point flow rate

SSP = sampler chart set point

m = sampler slope

b = sampler intercept

Ta = actual temperature (deg K)

Pa = actual pressure (mm Hg)

Ts = Average temperature (deg K)

Ps = Average pressure (mm Hg)

Average I(chart): 50.1

Average Flow over Sample (m3/min)

1.029348739

Enter Total Time (Hrs): 24.0

Total flow over sample (m3/min)

1482.262184

Total flow over sample (CFM)

52338.6777

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

Certificate of Analyzer Performance Testing

Calibrated Date : 30-Sep-23

Certificate No. : 0923-006

Page : 1/1

Analyzer Instruments

Analyzer Type : SO2 Analyzer

Manufacturer : Thermo Environmental

Model : 43C

Serial No. : CTL63588-340

Environmental

Temperature : 26.7 °C

Humidity : 44.0 %RH

Calibration System

Calibrator Units

Gas Calibration : Thermo Environmental

Zero Air Generator : API

Model : 146C

Model : 701

Serial No. : 514811458

Serial No. : 179

Standard Gas

NO Conc. : 2 ppm

Cylinder No. : CC750227

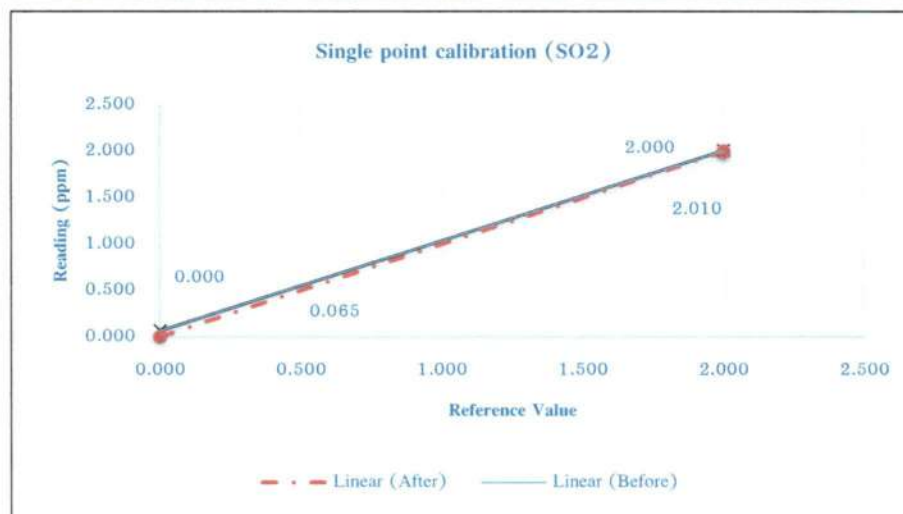
SO2 Conc. : 2 ppm

Expire Date : 21-Nov-23

CO Conc. : 50 ppm

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
SO2	0.065	0.000	0.07	2.01	2.000	0.50
After						
SO2	0.000	0.000	0.00	2.00	2.000	0.00



Calibrated by :

Tong Piima
(Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 1-Apr-23

Certificate No. : 0423-004

Page : 1/1

Analyzer Instruments

Analyzer Type : NO/NO/NO_x Analyzer

Manufacturer : Thermo Environmental

Model : 42C

Serial No. : 72454-371

Environmental

Temperature : 25.2 °C

Humidity : 52.3 %RH

Calibration System

Calibrator Units

Gas Calibration : Thermo Environmental

Zero Air Generator : API

Model : 146C

Model : 701

Serial No. : 514811458

Serial No. : 179

Standard Gas

NO Conc. : 2 ppm

Cylinder No. : CC750227

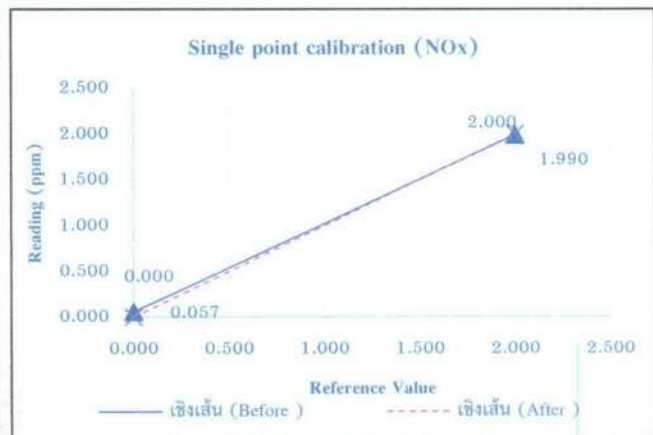
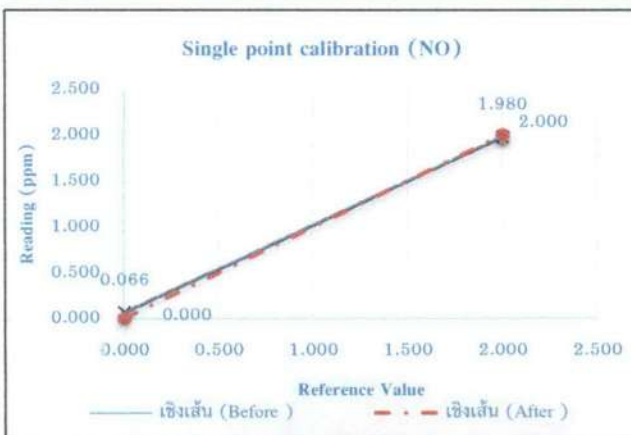
SO₂ : 2 ppm

Expire Date : 21-Nov-23

CO Conc. : 50 ppm

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
NO	0.066	0.000	0.07	1.98	2.00	-1.00
NO _x	0.057	0.000	0.06	1.99	2.00	-0.50
After						
NO	0.000	0.000	0.00	2.00	2.00	0.00
NO _x	0.000	0.000	0.00	2.00	2.00	0.00



Calibrated by :


(Mr. Tong Piima)



CERTIFICATION OF NIST (NBS) TRACEABILITY

DRYCAL CELL VOLUME CERTIFICATION

The Dry Cal DC-1 and DC-2M are true primary flow standards: Calibration is neither required nor possible as accuracy is dependent upon the dimensions of the flow measuring cell and the accuracy of the internal computer's crystal clock. Verification of NIST traceability therefore depends upon verification of these dimensions.

BIOS International certifies that the following Dry Cal products have been tested against NIST-traceable measuring instruments which are periodically checked by approved testing laboratories:-

- * Cell DC-1L Serial Number _____ I.D. 0.3665 inch \pm 0.0005 inch
- * Cell DC-1S Serial Number 451 I.D. 0.9445 inch \pm 0.001 inch
- * Cell DC-1H Serial Number _____ I.D. 1.7495 inch \pm 0.001 inch

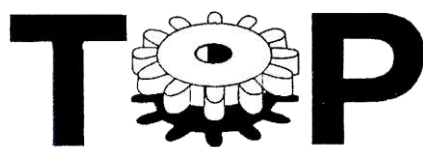
Encoder Length 1.000 inches \pm 0.001 inch

Certified with Mitutoyo Master Gage Blocks NIST Test Number 733/016498-88

Date: 10 December 2022 Expiry Date: 9 December 2023

By _____

A handwritten signature in black ink, appearing to read "Deaden", is written over a horizontal line.



Trade & Engineering

**TSP High Volume Sampler
TE-5000 TSP Sampler Verification
Site Information**

Location: -	Site ID: -	Date: 16 Oct 23
Sampler: TE-5000 TSP	Serial No: 3271	Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 27.20	Corrected Pressure (mm Hg): 690.9
Temperature (deg F): 75.8.	Temperature (deg K): 255.4
Average Press. (in Hg): 27.50	Corrected Average (mm Hg): 698.5
Average Temp (Deg F): 75.0	Average Temp: (Deg K): 297.0

Calibration Orifice

Make: Tisch	Qstd Slope: 1.58304
Model: TE-5028A	Qstd Intercept: -0.01520
Serial#: 1179	Calibration Due Date 12 December 2023

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	7.80	1.827	61.5	63.34	Slope: 31.5959
2	6.70	1.694	57.7	59.43	Intercept: 5.8641
3	5.90	1.590	54.3	55.93	Corr. Coeff: 0.9885
4	4.40	1.374	49.5	50.98	
5	3.80	1.278	43.6	44.91	
					# of Observations: 5

Calculations

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$
$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart response

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K

Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

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

m = sampler slope

b = sampler intercept

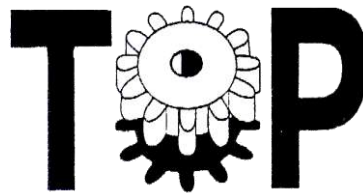
I = chart response

Tav = daily average temperature

Pav = daily average pressure

Enter Average I (chart):	53.3
Average Flow Calculation m3/min	1.434856906
Average Flow Calculation in cfm	50.66585053
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	2066.193944
Total flow in 24 hours cfm	72958.82476

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



Trade & Engineering

PM10 High Volume Sampler Verification

Site Information

Location: - Site ID: - Date: 2 October 2023
Sampler: TE-6070 PM10 Serial No: 3183 Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 27.02 Corrected Pressure (mm Hg): 686.3
Temperature (deg F): 75.3 Temperature (deg K): 297.1
Average Press. (in Hg): 26.70 Corrected Average (mm Hg): 678.2
Average Temp. (deg F): 76.1 Average Temp. (deg K): 297.5

Calibration Orifice

Make: Tisch Environmental, Inc. Qstd Slope: 1.58304
Model: TE-5028A Qstd Intercept: -0.01520
Serial#: 1179 Calibration Due Date: 12 Dec 23

Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	9.45	1.287	60.5	39.80	Slope 36.1461
2	7.75	1.167	55.3	36.38	Intercept -6.1754
3	6.50	1.069	50.7	33.36	Corr. Coeff 0.9935
4	5.75	1.006	45.3	29.80	SFR 1.115
5	4.60	0.901	39.6	26.05	SSP 51.87

of Observations: 5

Calculations

$Qa = 1/m(\text{Sqrt}((H2O)(Ta/Pa))-b)$
 $IC = I(\text{Sqrt}(Ta/Pa))$

Qa = actual flow rate
IC = corrected chart response
m = calibrator slope
b = calibrator intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
For subsequent calculation
of sampler flow:

$SFR = 1.13(Ps/Pa)(Ta/Ts)$
 $SSP = (m*SFR+b)(\text{Sqrt}(Pa/Ta))$
SFR = sampler set point flow rate
SSP = sampler chart set point
m = sampler slope
b = sampler intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
Ts = Average temperature (deg K)
Ps = Average pressure (mm Hg)

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

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

Average I(chart): 50.3
Average Flow over Sample (m3/min)
1.092521097
Enter Total Time (Hrs): 24.0
Total flow over sample (m3/min)
1573.23038
Total flow over sample (CFM)
55550.76473

Certificate of Analyzer Performance Testing

Calibrated Date : 26-Aug-23

Certificate No. : 0823-004

Page : 1/1

Analyzer Instruments

Analyzer Type : SO2 Analyzer

Manufacturer : Thermo Environmental

Model : 43C

Serial No. : 43C-77419-385

Environmental

Temperature : 25.1 °C

Humidity : 46.2 %RH

Calibration System

Calibrator Units

Gas Calibration : Thermo Environmental

Zero Air Generator : API

Model : 146C

Model : 701

Serial No. : 514811458

Serial No. : 179

Standard Gas

NO Conc. : 2 ppm

Cylinder No. : CC750227

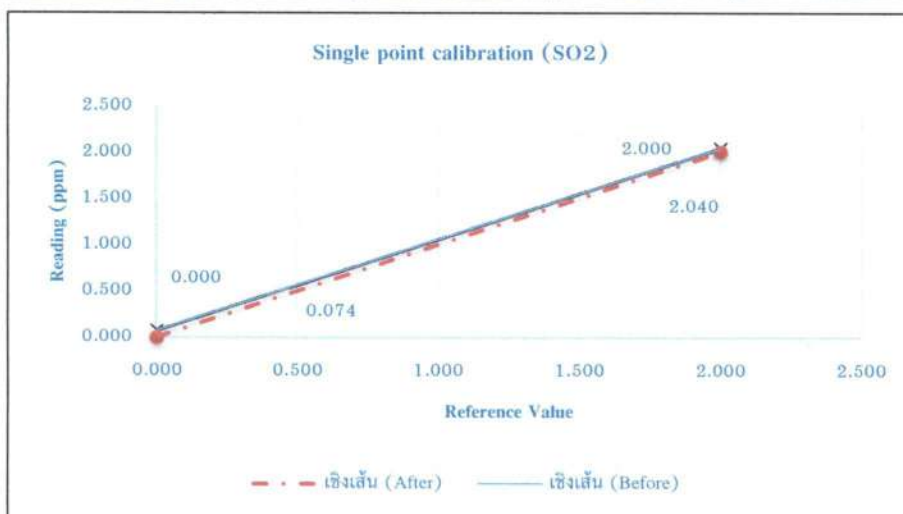
SO2 Conc. : 2 ppm

Expire Date : 21-Nov-23

CO Conc. : 50 ppm

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
SO2	0.074	0.000	0.07	2.04	2.000	2.00
After						
SO2	0.000	0.000	0.00	2.00	2.000	0.00



Calibrated by :


(Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 4-Jul-23

Certificate No. : 0723-001

Page : 1/1

Analyzer Instruments

Analyzer Type : NO/NO/NO_x Analyzer

Manufacturer : Thermo Environmental

Model : 42C

Serial No. : 63470-339

Environmental

Temperature : 25.1 °C

Humidity : 40.4 %RH

Calibration System

Calibrator Units

Gas Calibration : Thermo Environmental

Zero Air Generator : API

Model : 146C

Model : 701

Serial No. : 514811458

Serial No. : 179

Standard Gas

NO Conc. : 2 ppm

Cylinder No. : CC750227

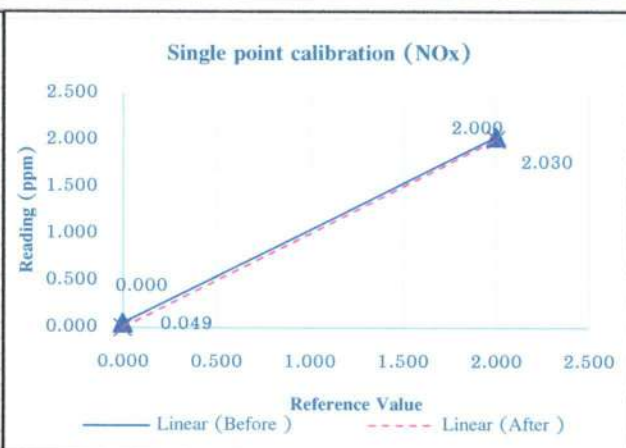
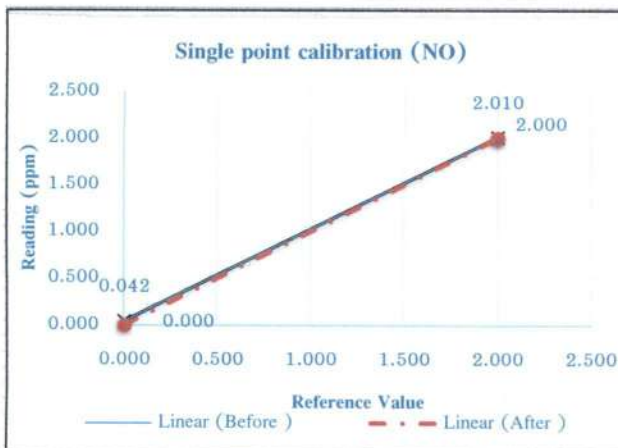
SO₂ : 2 ppm

Expire Date : 21-Nov-23

CO Conc. : 50 ppm

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
NO	0.042	0.000	0.04	2.01	2.00	0.50
NO _x	0.049	0.000	0.05	2.03	2.00	1.50
After						
NO	0.000	0.000	0.00	2.00	2.00	0.00
NO _x	0.000	0.000	0.00	2.00	2.00	0.00



Calibrated by :


(Mr. Tong Piima)



Environmental Solution Integrator Co.,Ltd.

Web Site : www.esithailand.com

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METHOD 5 CONSOLE CALIBRATION
USING REFERENCE WET TEST METER W-NK-2.5B No.545141
5-POINT METRIC UNIT

Meter Console Information	
Console Model Number	XC-572-V
Console Serial Number	1706095
DGM Model Number	SK25EX
DGM Serial Number	00003201

Calibration Conditions			
Date	Time	1-Mar-23	9:00 AM
Calibration Reference No.		SE66AP008	
Barometric Pressure		759.00	mm Hg
Calibration Meter Gamma		1.001	

Factors/Conversions		
Std Temp	293	K
Std Press	760	mm Hg
K ₁	0.386	
Console Leak Check		PASS

Calibration Data									
Run Time	Metering Console					Calibration Meter			
Elapsed (θ)	DGM Orifice ΔH (P _m)	Volume Initial (V _{mi})	Volume Final (V _{mf})	Outlet Temp Initial (t _{mi})	Outlet Temp Final (t _{mf})	Volume Initial (V _{wi})	Volume Final (V _{wf})	Outlet Temp Initial (t _{wi})	Outlet Temp Final (t _{wf})
min	mm H ₂ O	m ³	m ³	°C	°C	m ³	m ³	°C	°C
14.78	13.0	157.9816	158.1218	22	22	520.107380	520.253360	22	22
14.88	13.0	158.1218	158.2619	22	22	520.253360	520.400000	22	22
9.27	26.0	158.2756	158.4156	22	22	520.414040	520.560840	22	22
9.27	26.0	158.4156	158.5556	22	22	520.560840	520.706320	22	21
14.77	40.0	158.5662	158.8462	22	22	520.717500	521.006980	21	21
14.87	40.0	158.8462	159.1262	23	23	521.006980	521.296100	21	21
13.47	50.0	159.1370	159.4170	23	23	521.307160	521.598740	21	21
13.52	50.0	159.4170	159.6970	23	23	521.598740	521.891000	21	21
10.65	70.0	159.7130	159.9930	23	24	521.907620	522.198800	21	21
10.80	70.0	159.9930	160.2730	24	24	522.198800	522.490600	21	21



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 Environmental Solution Integrator Co., Ltd.



Environmental Solution Integrator Co.,Ltd.

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METHOD 5 CONSOLE CALIBRATION
USING REFERENCE WET TEST METER W-NK-2.5B No.545141
5-POINT METRIC UNIT

Calibration Data								
Results								
Standardized Data				Dry Gas Meter				
Dry Gas Meter		Calibration Meter		Calibration Factor		Flowrate		
(V _{m(std)})	(Q _{m(std)})	(V _{w(std)})	(Q _{w(std)})	Value	Variation	Std & Corr	.0212 m ³ _{std} /min	Variation
m ³	m ³ /min	m ³	m ³ /min	(Y)	(ΔY)	(Q _{m(std)(corr)})	(ΔH@)	(ΔΔH@)
						m ³ /min	mm H ₂ O	
0.139	0.009	0.145	0.010	1.041	0.003	0.010	60.638	10.958
0.139	0.009	0.146	0.010	1.046	0.008	0.010	60.909	11.229
0.139	0.015	0.146	0.016	1.047	0.009	0.016	47.239	-2.441
0.139	0.015	0.145	0.016	1.038	0.000	0.016	48.019	-1.661
0.280	0.019	0.288	0.020	1.031	-0.007	0.020	47.427	-2.253
0.280	0.019	0.288	0.019	1.030	-0.008	0.019	48.191	-1.489
0.280	0.021	0.290	0.022	1.037	-0.001	0.022	48.691	-0.989
0.280	0.021	0.291	0.022	1.040	0.002	0.022	48.825	-0.855
0.281	0.026	0.290	0.027	1.034	-0.004	0.027	42.916	-6.764
0.281	0.026	0.291	0.027	1.036	-0.002	0.027	43.946	-5.734
				1.038	Y Average		49.680	ΔH@ Average



Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ± 0.02 .

Note: For $\Delta H_{@}$, orifice pressure differential that equates to 0.75cfm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ± 0.2 inches (5.1mm) H₂O.

Calibrated by :

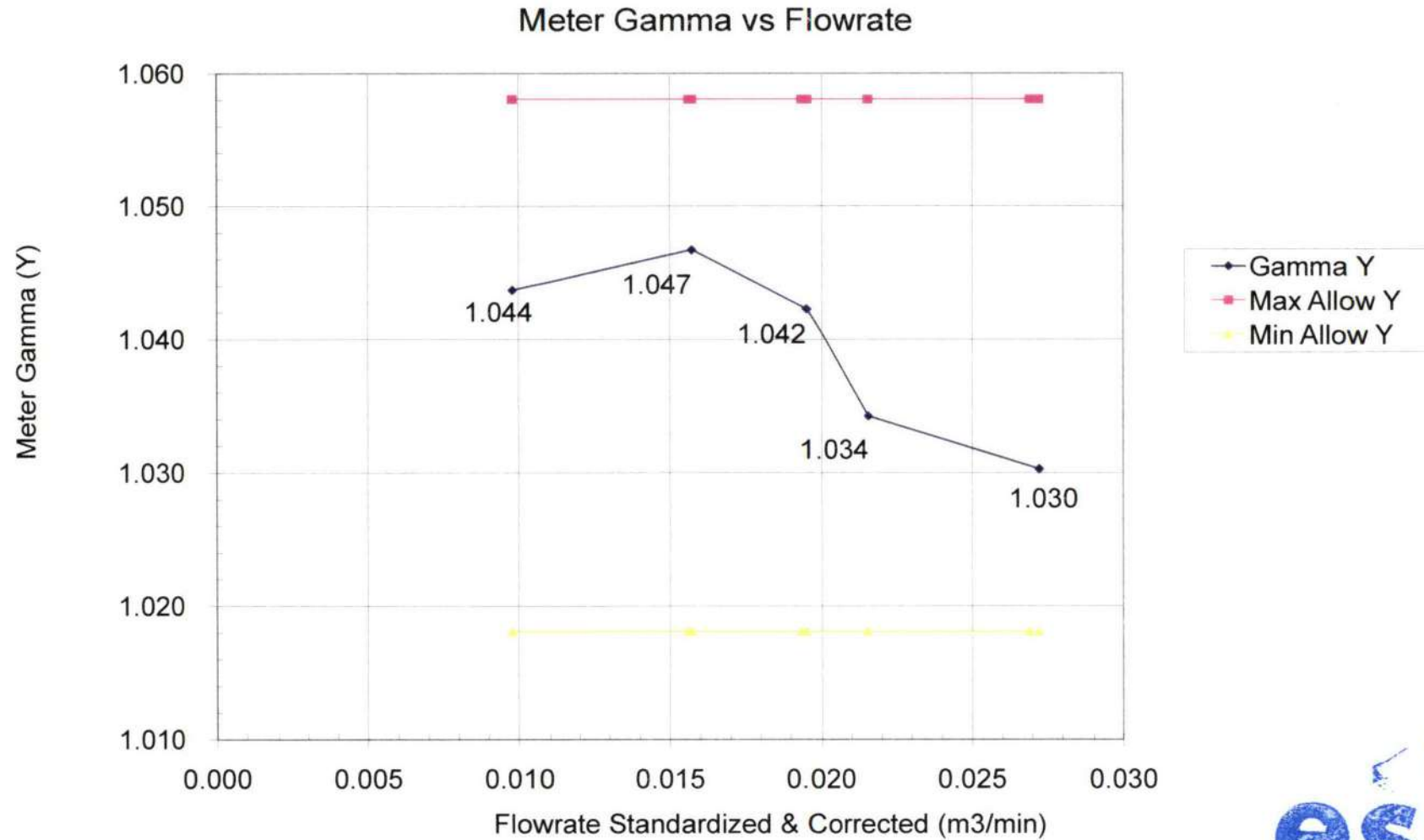
Kiatkawan

Approved by :

Terasing Samthong

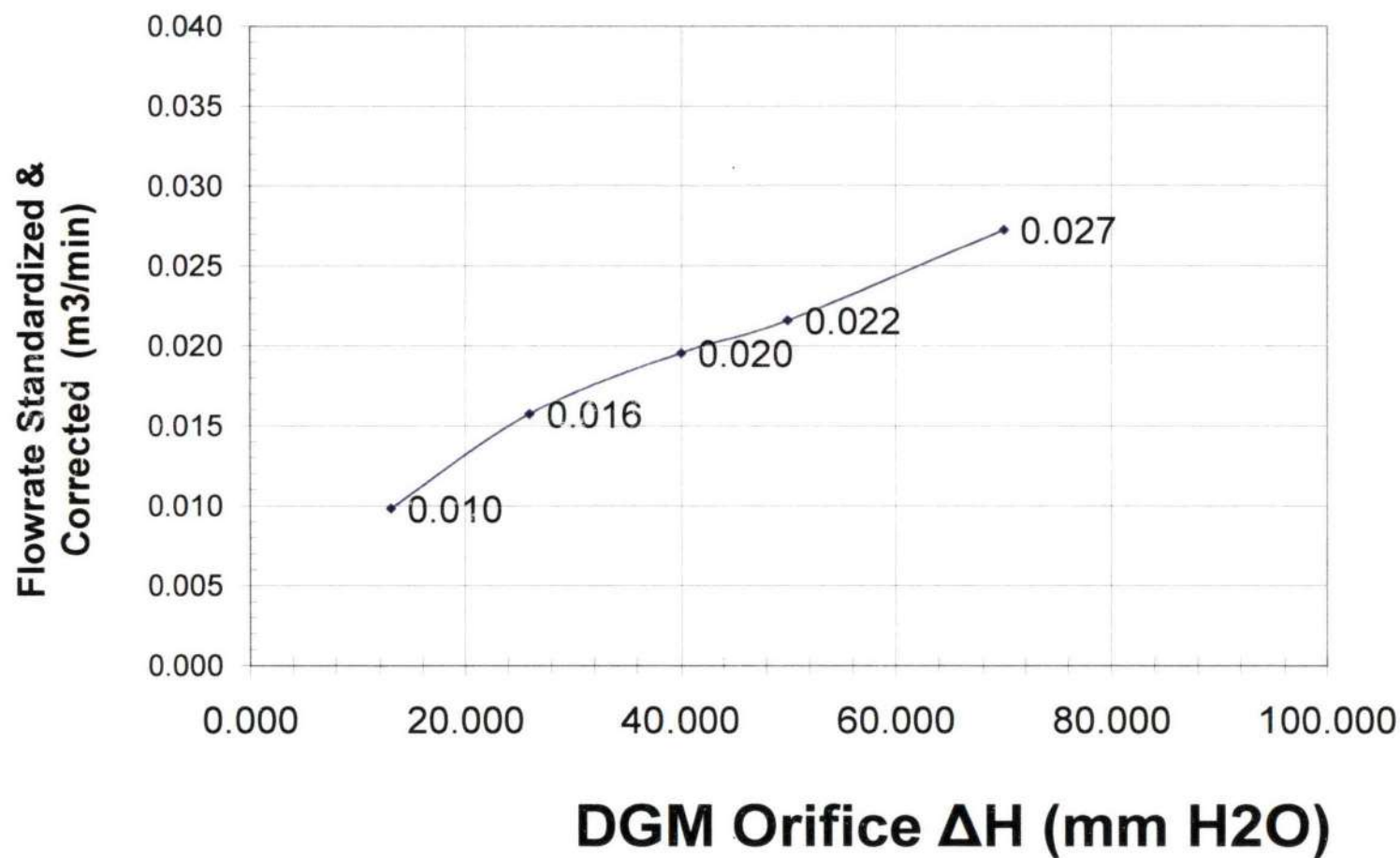
Date

1-Mar-23



บริษัท อีเอสไอ โซลูชั่นส์ จำกัด
Environmental Solution Integrator Co., Ltd.

Meter Pressure vs Flowrate





Environmental Solution Integrator Co., Ltd.
Web Site : www.esithailand.com
E-mail : info@esithailand.com

PITOT TUBE CALIBRATION

Sampling System Equipment Information	
Console Model Number	XC-572-V
Console Serial Number	1706095
DGM Model Number	SK25EX
DGM Serial Number	00003201
Pitot tube Number	A8152

Calibration Conditions			
Date	Time	03-Mar-23	9:00 AM
Calibration Reference No.	SE66AP008		
Barometric Pressure	759	mm Hg	
Pitot Tube Type	S		
size (OD)	3/8	inch	
Standard Pitot Tube ID Number	160-12		
C _p (std)	0.99		

Results				
"A" SIDE CALIBRATION				
RUN No.	Δp std	Δp (s)	C _p (s)	DEVIATION
	mm H ₂ O	mm H ₂ O		C _p (s)-C _p (A)
1	6.4	8.8	0.844	0.000
2	16.4	22.6	0.843	-0.001
3	30.8	42.2	0.846	0.001
	AVERAGE	C _p (SIDE A)	0.844	-0.001

Results				
"B" SIDE CALIBRATION				
RUN No.	Δp std	Δp (s)	C _p (s)	DEVIATION
	mm H ₂ O	mm H ₂ O		C _p (s)-C _p (B)
1	6.4	8.8	0.844	0.002
2	16.4	22.8	0.840	-0.002
3	30.8	42.6	0.842	0.000
	AVERAGE	C _p (SIDE B)	0.842	0.000

$$[C_p(A \text{ SIDE A}) - C_p(\text{SIDE B})] = 0.003 \quad (\text{must be } \leq 0.01)$$

Note: Average deviation must be < 0.01

Calibrated by : Kiatkawin

Approved by : Panday Sangthong



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Environmental Solution Integrator Co., Ltd.



NOZZLE CALIBRATION

Sampling System Equipment Information		Calibration Conditions			
Console Model Number	XC-572-V	Date	Time	02-Mar-23	9:00 AM
Console Serial Number	1706095	Calibration Reference No.		SE66AP008	
DGM Model Number	SK25EX	Barometric Pressure		755	mm Hg
DGM Serial Number	00003201	Calibration		Vernier, 0-150mm	0.01 mm increments
Nozzle Types	Stainless	Method Reference		US EPA Method	

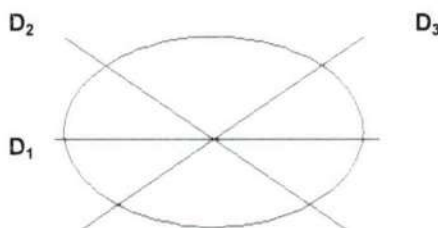
Calibration Data					Results	
Nozzle ID	Nozzle Diameter				Different	$(D_1 + D_2 + D_3) / 3$
Sizes		D ₁	D ₂	D ₃	ΔD	Davg
	mm	mm	mm	mm	mm	mm
4	3.2	2.91	2.90	2.92	0.010	2.910
6	4.8	4.60	4.61	4.60	0.006	4.603
7	5.3	5.01	5.02	5.00	0.010	5.010
9	7.1	6.72	6.75	6.73	0.015	6.733
10	7.9	7.77	7.77	7.74	0.017	7.760
12	9.5	9.36	9.35	9.34	0.010	9.350
14	11.1	10.91	10.92	10.91	0.006	10.913

Where :

D₁, D₂, D₃ = There difference nozzle diameters , mm ; diameter must be within 0.025 mm

ΔD = Maximum difference between any two diameters, must be ≤ 0.100 mm

Davg = $(D_1 + D_2 + D_3) / 3$



Calibrated by : Kiatkha win

Approved by : Tasadin Sangkha



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Environmental Solution Integrator Co., Ltd.

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THERMOCOUPLES SYSTEM CALIBRATION

Sampling System Equipment Information

Console Model Number	XC-572-V
Console Serial Number	1706095
DGM Model Number	SK25EX
DGM Serial Number	00003201
Meter Box Model Number	JC765KF
Meter Box Serial Number	JC16447

Calibration Conditions

Date	Time	02-Mar-23	11:00 AM
Calibration Reference No.	SE66AP008		
Reference Thermometer	FLUKE 714		
Serial Number	1812153		
Dry Box Calibrator	Pyros 650		
Serial Number	K38111		

Results

Console Thermocouple Simulator

Channel and test point	Meter Box Channel Temperature Reading (°C)										
	-18.0	25.0	38.0	93.0	149.0	260.0	371.0	482.0	593.0	816.0	1038.0
Stack	-18	25	39	93	150	258	369	481	591	814	1036
Filter	-17	25	39	93	150						
Aux	-17	25	39	93	150						
Probe	-17	25	39	93	150						
Oven	-17	25	39	93	150						
Exit	-17	25	39								

OUTLET DGM Thermocouple

Set Point	Reference Thermocouple	Probe Thermocouple	Difference
30	30.0	28	0.66
40	40.0	38	0.64
50	50.0	47	0.93

Sample Probe Thermocouple

Set Point	Reference Thermocouple	Probe Thermocouple	Difference
100	100.0	98	0.54
250	250.0	249	0.19
300	300.0	297	0.52
350	350.0	348	0.32

Tolerances Range

Stack $\pm 1.50\%$ Absolute
DGM $\pm 3.0\text{ }^{\circ}\text{C}$
Probe $\pm 3.0\text{ }^{\circ}\text{C}$

Meter $\pm 3.0\text{ }^{\circ}\text{C}$
Filter $\pm 3.0\text{ }^{\circ}\text{C}$
Exit $\pm 2.0\text{ }^{\circ}\text{C}$

Calibrated by : KiatkavinApproved by : Tanadon Sangthongบริษัท โซลูชันสิ่งแวดล้อมไทย จำกัด
Environmental Solution Integrator Co., Ltd.

Calibration Test Report

Report No: EN-202306010

Date: 10-June-2023

Instrument description : Flue gas Analyzer
Instrument SN : 4467
Model : E4500-S
Manufacture : E-INSTRUMENTS
Customer Name : CEM Technology Thailand Co., Ltd.
Customer address : 31/8 Moo 13, Rai Khing, Sam Phran, Nakhon Pathom 73210

Total page of Calibration : 2 pages

Parameter of Calibration : Gas Calibration (Oxygen, Carbon Monoxide, Nitric Oxide, Sulphur Dioxide, Nitrogen Dioxide)

Calibration Date : 10 June 2023

Ambient condition		Measurement Unit
Ambient Temperature	25 ± 5	°C
Flue gas Temperature	25 ± 5	°C
Humidity	55 ± 10	%RH

Prob:	Type:	Flue Prob	SN:	N/A
Cell Type:	AAC SE15	Type:	O2	
	AAC SE12		CO	
	AAC SE10		NO	
	AAC SE14		NO2	
	AAC SE13		SO2	

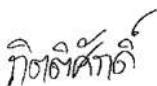
Standard References

Standard	Cylinder Number	Expiration Date
Oxygen (O2) 19.98 % Vol	CC5078523	Dec 11, 2025
Carbon Monoxide (CO) 4535 ppm	EB0129027	Oct 29, 2027
Nitric Oxide (NO) 55.47 ppm	EB0129027	Oct 29, 2027
Sulphur Dioxide (SO2) 55.11 ppm	EB0129027	Oct 29, 2027
Nitrogen Dioxide (NO2) 55.47 ppm	EB0129027	Oct 29, 2027

Calibration Results

Certificate Number	Reference	Reading	Error	% Error	Measurement Unit
Oxygen (O2)	19.98 %Vol	19.99	0.01	0.1	%Vol
Carbon Monoxide (CO)	1000 ppm Dilution	995.8	-4.20	-0.4	ppm
Nitric Oxide (NO)	55.47 ppm	55.3	-0.17	-0.3	ppm
Sulphur Dioxide (SO2)	55.11 ppm	54.6	-0.51	-0.9	ppm
Nitrogen Dioxide (NO2)	55.47 ppm	55.2	-0.27	-0.5	ppm

Calibration by



Mr. Kittisak Junsangwattana
Technician

Approve by



Mr. Pasagorn Samol
Technician Manager