

ภาคผนวกที่ 4

สรุปเอกสารสอบเทียบอุปกรณ์เครื่องมือ



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 : stc.cal@gmail.com Website : stc-cal.com



Certificate of Calibration

Certificate No. STCR-2311033-6

Work Order No. STCR-2311033

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 : PN2367
Control Number : NS-08-007
Received Date : Nov 15, 2023
Calibration Date : Nov 16, 2023
Recommended Due Date : Nov 16, 2024
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions

Ambient Temperature : (25 ± 2) °C
Ambient Relative Humidity : (50 ± 15) %RH
Calibration Place : Permanent Calibration Laboratory

Condition as received : Normal

Calibration Result : See data attached

- The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
- The 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
- The working standard is indicated in page 2 of this certificate.
- 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.
- This results of this report only to the items calibrated.

Date of Issue : Nov 17, 2023
Calibrated by : A. Somchai



Approved by :



Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2311033-6

Page 2 of 3

Standards Equipment Used

Equipment Name : Sound Calibrator
Serial No. : N975186
Certificate No. : 5523631030478623
Due Date : Nov 9, 2024
Traceability to : ANAB : AC-1969

Traceability

This calibration is traceable to the International System of Unit via :
- ANAB : The ANSI National Accreditation Bord.





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-2311033-6

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	94.09 dB 114.07 dB	91.4 dB 111.3 dB	94.0 dB 113.9 dB	0.09 dB 0.17 dB	0.40 dB 0.40 dB
SLOW	94.09 dB 114.07 dB	91.4 dB 111.3 dB	93.9 dB 113.9 dB	0.19 dB 0.17 dB	0.40 dB 0.40 dB

Sound Level Calibration @ Frequency 1 kHz Select : C

Response times	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB 114.07 dB	91.4 dB 111.4 dB	94.0 dB 113.9 dB	0.09 dB 0.17 dB	0.40 dB 0.40 dB
SLOW	94.09 dB 114.07 dB	91.4 dB 111.4 dB	94.0 dB 113.9 dB	0.09 dB 0.17 dB	0.40 dB 0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -

Customer Name : CEM Technology Thailand Co., Ltd.

31/8 Village No.13 Rakkhing Sub-district, Samphran District, Nakhonpathom, 73210

Equipment Name : Sound Level Meter
Manufacturer : pulsar
Model : 44
Serial Number : PN2366
Control Number : NS-08-006
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 ± 2) °C
Ambient Relative Humidity : (50 ± 15) %RH
Calibration Place : Permanent Calibration Laboratory

Condition as received : Normal
Calibration Result : See data attached

- The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
- The 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
- The working standard is indicated in page 2 of this certificate.
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Date of Issue : Feb 24, 2023

Calibrated by : M. Thippatai

Approved by :



(M. Thippatai)
Laboratory Manager

Calibration Report

Smart Tech Calibration & Services Co.,Ltd.

Certificate No.: STCR-2302027-12

Page 2 of 3

Standards Equipment Used

Equipment Name
Sound Calibrator

Serial No.
N975186

Certificate No.
551220085447862

Due Date
Nov 2, 2023

Traceability to
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-2302027-12

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 lines	STD. Value	UUC. Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.07 dB	94.9 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	114.8 dB	113.9 dB	0.15 dB	0.40 dB
SLOW	94.07 dB	94.9 dB	94.0 dB	0.07 dB	0.40 dB
	114.05 dB	114.8 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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THANYABURI, PATHUM THANI 12110, THAILAND
Tel. +662-114-3148 Email : stcail.md@gmail.com Website : stc-cal.com



Certificate of Calibration

Certificate No. STCR-2311033-4
Work Order No. STCR-2311033
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 : PN2319
Control Number : NS-08-003
Received Date : Nov 15, 2023
Calibration Date : Nov 16, 2023
Recommended Due Date : Nov 16, 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

- The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
- The 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
- The working standard is indicated in page 2 of this certificate.
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- This results of this report only to the items calibrated.



Date of Issue : Nov 17, 2023
Calibrated by : A. Somchai

Approved by :
(Mr. Chaiyot Wongpree) Laboratory Manager

Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2311033-4

Page 2 of 3

Standards Equipment Used

Equipment Name : Sound Calibrator
Serial No. : N975186
Certificate No. : 5523631030478623
Due Date : Nov 9, 2024
Traceability to : 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-2311033-4

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	94.09 dB 114.07 dB	92.7 dB 112.8 dB	93.9 dB 113.9 dB	0.19 dB 0.17 dB	0.40 dB 0.40 dB
SLOW	94.09 dB 114.07 dB	92.7 dB 112.8 dB	93.9 dB 113.9 dB	0.19 dB 0.17 dB	0.40 dB 0.40 dB

Sound Level Calibration @ Frequency 1 kHz

Select : C

Response times	STD. Value	UUC Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB 114.07 dB	92.8 dB 112.8 dB	93.9 dB 113.9 dB	0.19 dB 0.17 dB	0.40 dB 0.40 dB
SLOW	94.09 dB 114.07 dB	92.8 dB 112.8 dB	93.9 dB 113.9 dB	0.19 dB 0.17 dB	0.40 dB 0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



SMART TECH CALIBRATION & SERVICES CO., LTD.
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Tel : +662-114-3148 Email : stcal.mt@gmail.com Website : stc-cal.com



ANAB
ASEAN National Accreditation Board
ACCREDITED
CALIBRATION LABORATORY
AC-3093

Certificate of Calibration

Certificate No. STCR-2402038-12
Work Order No. STCR-2402038

Page 1 of 3

Customer Name : CEM Technology Thailand Co., Ltd.
31/8 Moo.13 Raikhang 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 16, 2024
Calibration Date : Feb 21, 2024
Recommended Due Date : Feb 21, 2025
Calibration Method : Calibration Procedure No. CPE-04-01

Environmental Conditions
Ambient Temperature : (25 ± 2) °C
Ambient Relative Humidity : (50 ± 15) %RH
Calibration Place : Permanent Calibration Laboratory

Condition as received : Normal
Calibration Result : See data attached

- The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
- The 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
- The working standard is indicated in page 2 of this certificate.
- 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.
- This results of this report only to the items calibrated.



Date of Issue : Feb 22, 2024
Calibrated by : S. Sompoch

Approved by :



Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2402038-12

Page 2 of 3

Standards Equipment Used

Equipment Name: Sound Calibrator
Serial No.: N975186
Certificate No.: 5523631030478623
Due Date: Nov 9, 2024
Traceability to: ANAB : AC-1969

Traceability

This calibration is traceable to the International System of Unit via :
- ANAB : The ANSI National Accreditation Board.



Calibration Report

Smart Tech Calibration & Services Co., Ltd.

Certificate No.: STCR-2402038-12

Page 3 of 3

UUC Range : (30 to 130) dB
Resolution : 0.1 dB
Results of Calibration: [] Without adjustment [☒] With adjustment
Appearance and Function of Use Inspection : GOOD

Sound Level Calibration @ Frequency 1 kHz Select : A

Response times	STD Value	UUC Reading		Correction	(±) Uncertainty
		Before Adjustment	After Adjustment		
FAST	94.09 dB 114.07 dB	94.8 dB 114.7 dB	94.0 dB 114.0 dB	0.09 dB 0.07 dB	0.40 dB 0.40 dB
SLOW	94.09 dB 114.07 dB	94.7 dB 114.7 dB	94.0 dB 114.1 dB	0.09 dB -0.03 dB	0.40 dB 0.40 dB

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



Certificate of Calibration

Customer
Name : C.E.M. Technology (Thailand) Co., Ltd.
Address : 31/8 Moo 13 Unmanned Road, Rai Khing, Sam Phran District,
Nakhon Pathom 73210 Thailand

Certificate No : 24-TPM-137
Request No : Req-2024-0571
Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : Area Heat Stress Monitor
Manufacturer : METROSONICS
Model : hs-32
Serial Number : MCD080039
Resolution : 0.1 °C
ID Number : -

Range Calibration : 10 °C to 40 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 4.5
Calibration Position (mm) : 67.5
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 7 March 2024
Calibrated Date : 12 March 2024
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard
12000077, ID: AR-TPM Which was calibrated on 27 October 2023, Calibration Certificate No.: QR23-2574

Traceability
: This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0292

Note

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

Approved By : 
Mr. Noppadol Luangart
Technical Manager
Issue Date : 12 March 2024



Calibration Note
UUC Adjustment : Not Adjust

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
WET	10.029	10.0	0.0	0.13
	25.032	24.9	+ 0.1	0.13
	40.038	39.9	+ 0.1	0.13
DRY	10.030	10.0	0.0	0.13
	25.034	24.9	+ 0.1	0.13
	40.038	39.9	+ 0.1	0.13
GLOBE	10.028	10.0	0.0	0.13
	25.033	24.8	+ 0.2	0.13
	40.039	39.8	+ 0.2	0.13

End of Certificate

Calibrated By : 
Mr. Sirichok Jirapadeesakul



Certificate of Calibration

Customer
Name : C.E.M. Technology (Thailand) Co.,Ltd.
Address : 31/8 Moo 13 Unnamed Road, Rai Kling, Sam Phran District,
Nakhon Pathom 73210 Thailand

Certificate No : 24-TPM-196
Request No : Req-2024-0863
Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : TEMPERATURE (WBGT) METER
Manufacturer : JANTYTECH
Model : JT2011-E2A
Serial Number : 3522210182
Resolution : 0.1 °C
ID Number : HT-03-001
Range Calibration : 10 °C to 40 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 4.5
Calibration Position (mm) : 67.5
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 23 April 2024
Calibrated Date : 3 May 2024
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard :
Digital Thermometer with Sensor, Manufacturer: GINGO GINGO, Model: GT11/RTD100, SN: 08000057, ID: 02-TPM Which was calibrated on 1 March 2024, Calibration Certificate No. : QR24-0478

Traceability : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0292

Note

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

Approved By :
Mr. Noppadol Luangart
Technical Manager
Issue Date : 3 May 2024



Calibration Note
UUC Adjustment : Not Adjust
Certificate No : 24-TPM-196
Request No : Req-2024-0863
Page : 2/2

Result of Calibration :

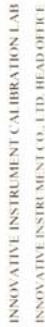
UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
WET (T _w)	10.010	9.9	- 0.1	0.13
	25.032	25.0	0.0	0.13
	40.037	40.0	0.0	0.13
DRY (T _a)	10.028	10.1	- 0.1	0.13
	25.034	25.0	0.0	0.13
	40.038	39.9	+ 0.1	0.13
GLOBE (T _g)	10.010	9.9	+ 0.1	0.13
	25.033	24.9	- 0.1	0.13
	40.039	39.9	+ 0.1	0.13

End of Certificate

Calibrated By :
Mr. Sittichok Jirapodsaksul



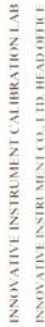
INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
719 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KALO,
AMPHOE BANG PHU SAKHIT PRAKARN PROVINCE 10540 THAILAND
TEL: (66)0-2116-5869-1 FAX: (66)0-2116-7140



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AMPHOE BANG PHU SAKHIT PRAKARN PROVINCE 10540 THAILAND
TEL: (66)0-2116-5869-1 FAX: (66)0-2116-7140

Certificate of Calibration

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

Name : 318 Moo 13 Unnamed Road, Rai Klang, Sam Phran District,

Address : Nakhon Pathom 73210 Thailand

Certificate No : 24-TPM-195

Request No : Req-2024-0864

Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : TEMPERATURE (WBGT) METER
Manufacturer : JANTYTECH
Model : JT2011-E2A
Serial Number : 3522210185
Resolution : 0.1 °C
ID Number : HT-03-004
Range Calibration : 10 °C to 40 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 4.5
Calibration Position (mm) : 67.5
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 23 April 2024
Calibrated Date : 3 May 2024
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard : Digital Thermometer with Sensor, Manufacturer: GINGO GINGO, Model: GT11 RTD100, SN:

08000057, ID: 02-TPM Which was calibrated on 1 March 2024, Calibration Certificate No. : QR-24-0478

Traceability : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSAC Accreditation No.:

Calibration 0292

Note

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

Approved By :

Mr. Noppadon Luangart
Technical Manager

Issue Date :

3 May 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
FM-708-TPM-01 Rev 01 Issue date 13/02/20

INNOVATIVE INSTRUMENT CALIBRATION LAB

INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE

719 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KALO,

AMPHOE BANG PHU SAKHIT PRAKARN PROVINCE 10540 THAILAND

TEL: (66)0-2116-5869-1 FAX: (66)0-2116-7140



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AMPHOE BANG PHU SAKHIT PRAKARN PROVINCE 10540 THAILAND

TEL: (66)0-2116-5869-1 FAX: (66)0-2116-7140



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INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE

719 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KALO,

AMPHOE BANG PHU SAKHIT PRAKARN PROVINCE 10540 THAILAND

TEL: (66)0-2116-5869-1 FAX: (66)0-2116-7140

Certificate No : 24-TPM-195

Request No : Req-2024-0864

Page : 2/2

Calibration Note

UUC Adjustment : Not Adjust

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (±°C)
WET (T _w)	10.028	10.0	0.0	0.13
	25.032	25.0	0.0	0.13
	40.038	40.0	0.0	0.13
DRY (T _a)	10.028	10.1	- 0.1	0.13
	25.034	24.8	+ 0.2	0.13
	40.038	39.8	+ 0.2	0.13
GLOBE (T _g)	10.030	10.0	0.0	0.13
	25.033	25.0	0.0	0.13
	40.039	40.0	0.0	0.13

End of Certificate

Calibrated By :

Mr. Sittichok Jirapakdeesakul

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
FM-708-TPM-01 Rev 01 Issue date 13/02/20



Certificate of Calibration

Customer
Name : C.E.M. Technology (Thailand) Co., Ltd.
Address : 31/8 Moo 13 Unnamed Road, Rai Khong, Sam Phran District,
Nakhon Pathom 73210 Thailand

Certificate No : 24-TPM-197
Request No : Req-2024-0914
Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : TEMPERATURE (WBGT) METER
Manufacturer : JASTYTECH
Model : JT2011-E2A
Serial Number : 3522210183
Resolution : 0.1 °C
ID Number : HT-03-002
Range Calibration : 10 °C to 40 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 4.5
Calibration Position (mm) : 67.5
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 25 April 2024
Calibrated Date : 3 May 2024
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard : Digital Thermometer with Sensor, Manufacturer: GINGO GINGO, Model: GT1U/RTD100, SN:

08000057, ID: 02-TPM Which was calibrated on 1 March 2024, Calibration Certificate No. : QR24-0478

Traceability : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No. : Calibration 0292

Note

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

Approved By : 
Mr. Noppadon Luangart
Technical Manager
Issue Date : 3 May 2024



Calibration Note
UUC Adjustment : Not Adjust

Certificate No : 24-TPM-197
Request No : Req-2024-0914
Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
WET (T _{pw})	10.029	10.1	-0.1	0.13
	25.032	25.1	-0.1	0.13
	40.037	40.1	-0.1	0.13
DRY (T _a)	10.029	10.1	-0.1	0.13
	25.034	25.1	-0.1	0.13
	40.037	40.0	0.0	0.13
GLOBE (T _g)	10.029	10.1	-0.1	0.13
	25.033	25.2	-0.2	0.13
	40.038	40.2	-0.2	0.13

End of Certificate

Calibrated By : 
Mr. Sittichak Jirapokdeesakul



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

FM.BLMTC.002 Rev.4

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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

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.

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194/56, 194/57 Thakham Rd, Samsen Dom
Bang Khun Thian Bangkok 10150
Tel : 02-417-2144 Fax : 02-417-2155



Certificate of Calibration

Reference No. : C01580/2401-065 Certificate No. : S2401-3006
Customer : C.E.M. TECHNOLOGY (THAILAND) CO.,LTD Page 1 of 2

Equipment : Electronic Balance
Manufacturer : OHAUS
Model : SPX 1202
Serial No. : C325357974
ID No. : -

Received Date : 19 January 2024

Calibrated Date : 19 January 2024

Issued Date : 25 January 2024

Environment : Minimum Value Maximum Value

Ambient Temperature (°C) 30.0 30.9

Relative Humidity (% RH) 54 56

Atmospheric Pressure (mbar) 1011 1011

Place of Calibration : Warehouse

Calibrated by : Mr. Sarayut Lapkietsakul

Calibration Method

In-house method : SK-WI-08 base on UKAS Lab 14 Edition 6, July 2019

Guidance on the calibration of weighing machines used in testing and calibration laboratories

Reference standard instrument

Instrument ID No. Certificate No. Due Date

Standard Weight Set F1 MASS-WE-25 23M91 15 January 2024

Condition of this result of calibration

1. This result of calibration was found accurate as shown on date and place of calibration for this item only

2. This certificate can be traceable to International System of Unit :

- Through Technology Promotion Association (Thailand-Japan)

Approved by :

☐ Mr. Suphachai Sakri ☐ Mr. Phayak Tootit ☒ Miss Tantaraporn Pettong

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

This certificate may not be reproduced other than in full except with the prior written approval of the S K Sales And Service Company Limited.

Certificate No. : S2401-3006

Description of UUC

Capacity : 1200 g

Resolution : 0.01 g

Calibration Result

1.Repeatability of reading

Applied weight (g)	Standard Deviation of reading (g)
100	0.000
1000	0.000

2.Departure from nominal value

Without adjustment

Applied weight (g)	Balance reading (g)	Correction (g)	Uncertainty (± g)
Zero setting	0.00	0.00	0.0082
1	1.00	0.00	0.0082
100	100.00	0.00	0.0082
200	200.00	0.00	0.0082
300	300.00	0.00	0.0082
400	400.00	0.00	0.0082
500	500.00	0.00	0.0083
600	600.00	0.00	0.0083
700	700.00	0.00	0.0091
800	800.00	0.00	0.0091
900	900.00	0.00	0.0091
1000	1000.00	0.00	0.0091
1200	1200.00	0.00	0.0091

3.Effect of off-center loading : Used weight 400 g was place to various position on the pan

Position	Balance reading (g)
E	400.00
A	400.00
B	400.00
C	400.00
D	400.00
Maximum Difference	0.00



** End of Calibration Report **

SP.



CERTIFICATE OF CALIBRATION

NO. 20240313386

Name of Product: Sound Level Meter
Model: ST-11D
Serial Number: 821486
Specification: Class 1
Conclusion: Pass
Date of calibration: 2024-03-22
Due Date: 2025-03-21



Calibrated by: Jim Lin

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

- 1. Preliminary inspection: OK
- 2. Type & serial No. of Microphone: AWA14425-61344
- 3. Adjustments to indicated sound levels: Type of Calibrator B&K 4231
Sound Pressure Level 94.0 dB
- 4. Measuring up limits: 140 dBA
- 5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Nominal frequency /Hz	Frequency weighting / dB			Frequency weighting / dB		
	A	C	Z	A	C	Z
10	-71.5	-14.9	-1.0	0.0	0.0	-0.1
20	-50.4	-6.4	-0.4	1.3	-0.2	-0.1
31.5	-39.5	-3.1	-0.4	1.1	-0.7	0.0
63	-26.3	-0.9	-0.2	-1.0	-3.0	0.0
125	-16.2	-0.2	-0.1	-6.0	-7.9	-0.1
250	-8.7	-0.1	-0.1	-11.7	-13.7	0.0
500	-3.2	0.0	-0.1	-23.8	-25.8	-0.3

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

9.4 dB(A)	10.2 dB(C)	16.5 dB(Z)
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7. F&S Weighting

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

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

Reference sound level 90.0 dB
Max error at 10dB steps upper reference sound level 0.1 dB
Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB
Max error at 10dB steps below reference sound level 0.1 dB
Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB		
	L _{upper-L_a}	L _{center-L_a}	L _{lower-L_a}
500	0.0	-4.0	-2.9
200	-1.0	-7.4	-6.9
2	-17.9	-26.9	-26.9
0.25	-27.2	/	-36.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.4	2.4	2.4	2.4

11. Overload indications: PASS

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB
Sweep amplitude: 40 dB
Scan cycle time: 50 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L _{Aeq,T}	103.2	103.2	0.0
L _S	110.8	110.8	0.0
L _{L10}	108.8	108.8	0.0
L _{S0}	92.9	92.8	0.1
L _{S0}	76.9	76.8	0.1
L _{S5}	75.0	74.9	0.1

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

Environment conditions:

Air temperature: 25 °C
 Relative humidity: 60 %
 Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2025-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2025-10-15	CIGISMEC
Signal generator	DS 360	33873	2025-10-15	CEPREI

Test specifications:

1. All Scairlet's Sound level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMTP004-CA-152.
2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
3. The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

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

CERTIFICATE OF CALIBRATION

Certificate No. : 66S0929-3

Page : 1 of 2

Job No. : 66S0929

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 ± 2) °C
 Manufacturer : BSWA Tech Relative humidity : (50 ± 15) %
 Model : BSWA 309 Atmospheric pressure : -
 Serial No. : 590014 Date of received : 11-Sep-2023
 Identity No. : NS-04-001 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 :

[] Ms. Bhacharin Phannangkew (MD)

Reviewed By : [] Mr. Sompong Srisert

[] Mr. Boonyarit Auejirakarn

[] Ms. Natthaprakarn Thammaphan

The reported expanded uncertainty is based uncertainty multiplied by a coverage factor k = 2, providing a level of confidence approximately 95%.
 This result relates only to the item calibrated. The certificate shall not be reproduced except in full, without the written approval of the calibration director.

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	114.0	0.0	0.20
B	94	94.0	0.0	0.20
	104	104.0	0.0	0.20
	114	114.0	0.0	0.20
Z	94	94.0	0.0	0.20
	104	104.1	0.1	0.20
	114	114.1	0.1	0.20

UUC* = Unit Under Calibration

- The End -

CERTIFICATE OF CALIBRATION

Certificate No. : 66S0929-2

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 ± 2) °C

Manufacturer : BSWA Tech

Relative humidity : (50 ± 15) %

Model : BSWA 309

Atmospheric pressure : -

Serial No. : 590101

Date of received : 11-Sep-2023

Identity No. : NS-04-002

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 :

Mr. Bhacharin Phangkaew (MD)

Reviewed By : Mr. Sompong Srisert

Mr. Boonyarit Auejirakarn

Mr. Natthaprakarn 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	93.9	-0.1	0.20
	104	103.9	-0.1	0.20
	114	113.9	-0.1	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	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 -



**ELECTRICAL AND ELECTRONICS INSTITUTE
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Tel: +66 2709 4860 Fax: +66 2324 0917



Certificate No.: CP20240128EA
Operation No.: CP2024030097

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: ACO
Model/Type: 6236 (Meter), 7052NR (Microphone), - (Preamplifier)
Serial No.: 222189 (Meter), 84153 (Microphone), - (Preamplifier)
ID No.: NS-03-019
Customer: C.E.M. Technology (Thailand) Co.,Ltd.
Address: 31/8 Moo 13 T.Rai Khung, A.Sam Phran,
Nakorn Phatom 73210
Received Date: 7 March 2024
Calibrated Date: 18 - 19 March 2024
Issued Date: 21 March 2024
Calibrated by: Ms. Juntaporn Kunhakom

Approved by:

(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.
The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.



Certificate No.: CP20240128EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: ACO
Model/Type: 6236 (Meter), 7052NR (Microphone), - (Preamplifier)
Serial No.: 222189 (Meter), 84153 (Microphone), - (Preamplifier)
ID No.: NS-03-019
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa
Method of Calibration :-
IEC61672-3:2013

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20230040EA	26 June 2024
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9609027	CB20230108EB	8 June 2024
5) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P230024 CD20230196EA	20 March 2024 23 July 2024
6) Pressure humidity and Temperature Transmitter	PTU301	F0640003	CL1-P230032 CD20230197EA	4 April 2024 23 July 2024
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EA CK20230072EA	13 February 2025 13 September 2024

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

3. This certification is traceable to the international system of unit maintained at :-

- Reference standards instrument for Acoustic function
 - National Institute of Metrology (Thailand)
- Reference standards instrument for Electrical function
 - National Institute of Metrology (Thailand)
 - Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

Certificate No.: CP20240128EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
20.7

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	17.2
C-weighting	24.8
Z-weighting	32.1

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

Meter free-field acoustic response at a level of 84 dB.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve		
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)
125	0.2	0.1	0.1
1000	-0.2	-0.2	-0.2
8000	-0.5	-0.4	-0.3
			Acceptance limits (dB)
			±1.5
			±1.0
			±5.0

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve		
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)
63	-0.1	-0.2	0.0
125	0.0	-0.2	0.1
250	0.0	0.0	0.0
500	0.1	0.0	0.1
1000	0.0	0.0	0.0
2000	-0.1	0.0	0.0
4000	-0.3	-0.3	0.0
8000	-0.5	-0.4	-0.2
			Acceptance limits (dB)
			±2.0
			±1.5
			±1.5
			±2.0
			±3.0
			±5.0



Certificate No.: CP20240128EA

CP20240128EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.3

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
99.0	99.0	0.0	±1.1
104.0	104.0	0.0	±1.1
109.0	109.0	0.0	±1.1
114.0	114.0	0.0	±1.1
119.0	119.0	0.0	±1.1
120.0	120.0	0.0	±1.1
121.0	121.0	0.0	±1.1

Certificate No.: CP20240128EA

CP20240128EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	43.9	-0.1	±1.1
39.0	38.9	-0.1	±1.1
34.0	34.0	0.0	±1.1
33.0	33.1	0.1	±1.1
32.0	32.2	0.2	±1.1
31.0	31.3	0.3	±1.1
30.0	30.4	0.4	±1.1
29.0	29.5	0.5	±1.1

Function : 8. Level Linearity including level range control

8.1 Level Linearity Including the Level Range (Reference Signal)

Range	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
20-100	94.0	94.0	0.0	±1.1
20-110	94.0	94.0	0.0	±1.1
30-120	94.0	94.0	0.0	±1.1
40-130	94.0	94.0	0.0	±1.1

8.2 Level Linearity including the Level range (5dB Above Under-range)

Range	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
20-80	25.0	25.3	0.3	±1.1
20-90	25.0	25.3	0.3	±1.1
20-100	25.0	25.2	0.2	±1.1
20-110	25.0	25.5	0.5	±1.1
30-120	35.0	35.0	0.0	±1.1
40-130	45.0	45.0	0.0	±1.1

Certificate No.: CP20240128EA

Calibration Report

Function : 9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	116.0	0.0	±1.0
	2	98.9	-0.1	+1.0 ; -2.5
	0.25	89.9	-0.1	+1.5 ; -5.0
Slow	200	109.5	-0.1	±1.0
	2	89.8	-0.2	+1.0 ; -5.0
	0.25	80.9	-0.1	+1.5 ; -5.0
LAE	200	109.9	-0.1	±1.0
	2	90.0	0.0	+1.0 ; -2.5
	0.25	80.9	-0.1	+1.5 ; -5.0

Function : 10. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	125.4	125.4	0.0	±3.0
Positive half cycle	124.4	124.2	-0.2	±2.0
Negative half cycle	124.4	124.2	-0.2	±2.0

Function : 11. Overload indication

Positive one-half cycle	Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
	Negative one-half cycle			
-	-	-	-	-

Function : 12. High-Level Stability

High-Level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	129.0	129.0	0.0	±0.3

Certificate No.: CP20240128EA

Calibration Report

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Level Linearity including level range control	0.30	0.30
9) Tone burst response	0.20	0.30
10) Peak C sound level	0.20	0.35
11) Overload indication	0.20	0.25
12) High-Level Stability	0.10	0.10

Remarks: 1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.

2. Overload indication can not measured because sound level meter can not set to Reference value of the standard calibration.

3. The acceptance limit is for the deviated value.

4. Acceptance limits was IEC61672-3:2013 Class 2.

5. The coverage factor $k = 2.00$

-- End of Report --



CERTIFICATE OF CALIBRATION

NO. 20240313387

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	821487
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-03-22
Due Date:	2025-03-21



Calibrated by:

Jim Lin

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

1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-S837Z

4. Measuring up limits: 140 dBA

3. Adjustments to indicated sound levels:

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Type of Calibrator: B8K 4231

Sound Pressure Level: 94.0 dB

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

Nominal frequency / Hz	Frequency weighting / dB				Frequency weighting / dB			
	A	C	Z	Nominal frequency / Hz	A	C	Z	Nominal frequency / Hz
10	-70.6	-14.1	-0.8	1000	0.1	0.0	0.0	0.0
20	-50.2	-6.1	-0.1	2000	1.3	-0.1	0.0	0.0
31.5	-39.4	-2.9	-0.2	4000	1.2	-0.7	0.0	0.0
63	-26.2	-0.8	0.0	8000	-1.1	-3.0	0.0	0.0
125	-16.1	-0.1	0.0	12500	-6.0	-7.9	-0.1	0.0
250	-8.6	0.0	0.0	16000	-11.7	-13.7	0.0	0.0
500	-3.2	0.1	0.0	20000	-23.8	-25.8	-0.2	0.0

6. Self-generated noise

Microphone replaced by electrical input signal device

8.6 dB(A)	8.5 dB(C)	17.7 dB(Z)
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7. F&S Weighting

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

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

Reference sound level 90.0 dB

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

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

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

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

9. Tone burst response (A Weighting) :

Single Toneburst duration / ms	Toneburst response / dB			
	L _{upper} -L _u	L _{lower} -L _u	L _u -L _u	L _{upper} -L _u
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-17.9	-26.9	-26.9	-7.0
0.25	-27.1	/	-36.0	-7.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.4	2.4	2.4	2.4

11. Overload Indications: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 50 S; Measurement period: 180 S.



ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT
975 Moo 4, Bangpoo Industrial Estate, Soi 8, Sukhumvit Road km 37,
Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280
Tel: +66 2709 4860 Fax: +66 2324 0917



Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L _{Aeq,T}	103.2	103.2	0.0
L _S	110.8	110.8	0.0
L ₁₀	108.8	108.8	0.0
L ₅₀	92.9	92.8	0.1
L ₉₀	76.9	76.8	0.1
L ₉₅	75.0	74.9	0.1

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

Environment conditions

Air temperature: 25 °C
Relative humidity: 60 %
Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2025-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2025-10-15	CIGISMEC
Signal generator	DS 360	33873	2025-10-15	CEPREI

Test specifications:

- All Scairlet's Sound level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

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

Certificate No.: CP20240127EA
Operation No.: CP2024030096

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: ACO
Model/Type: 6236 (Meter), 7052NR (Microphone), - (Preamplifier)
Serial No.: 222187 (Meter), 84151 (Microphone), - (Preamplifier)
ID No.: NS-03-017
Customer: C.E.M. Technology (Thailand) Co.,Ltd.
Address: 31/8 Moo 13 T.Rai Khung, A.Sam Phran,
Nakorn Phatom 73210

Received Date: 7 March 2024
Calibrated Date: 13 - 18 March 2024
Issued Date: 19 March 2024
Calibrated by: Ms. Juntaporn Kunhakom

Approved by: 
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.
The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k)
providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except
with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.



Certificate No.: CP20240127EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: ACO
Model/Type: 6236 (Meter), 7052NR (Microphone), - (Preamplifier)
Serial No.: 222187 (Meter), 84151 (Microphone), - (Preamplifier)
ID No.: NS-03-017
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa
Method of Calibration :-
IEC61672-3:2013

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20230040EA	26 June 2024
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9609027	CB20230108EB	8 June 2024
5) Pressure humidity and Temperature Transmitter	PTU301	F0640002	CL1-P230024 CD20230196EA	20 March 2024 23 July 2024
6) Pressure humidity and Temperature Transmitter	PTU301	F0640003	CL1-P230032 CD20230197EA	4 April 2024 23 July 2024
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EA CK20230072EA	13 February 2025 13 September 2024

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

3. This certification is traceable to the international system of unit maintained at :-

- Reference standards instrument for Acoustic function
- National Institute of Metrology (Thailand)
 - Reference standards instrument for Electrical function
 - National Institute of Metrology (Thailand)
 - Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

Certificate No.: CP20240127EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
21.6

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	17.0
C-weighting	24.7
Z-weighting	31.7

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

Meter free-field acoustic response at a level of 84 dB.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve		
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)
125	0.1	-0.2	0.0
1000	-0.2	-0.2	-0.2
8000	-0.2	-0.1	0.1

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve		
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)
63	-0.1	-0.2	0.0
125	0.1	-0.2	0.0
250	0.0	-0.1	0.0
500	0.1	0.0	0.0
1000	0.0	0.0	0.0
2000	-0.1	0.0	0.0
4000	-0.4	-0.3	-0.1
8000	-0.5	-0.4	-0.1



Certificate No.: CP20240127EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.3

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
99.0	99.0	0.0	±1.1
104.0	104.0	0.0	±1.1
109.0	109.0	0.0	±1.1
114.0	114.0	0.0	±1.1
119.0	119.0	0.0	±1.1
120.0	120.0	0.0	±1.1
121.0	121.0	0.0	±1.1

Certificate No.: CP20240127EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	74.0	0.0	±1.1
69.0	68.9	-0.1	±1.1
64.0	63.8	-0.2	±1.1
59.0	58.8	-0.2	±1.1
54.0	53.8	-0.2	±1.1
49.0	48.8	-0.2	±1.1
44.0	43.8	-0.2	±1.1
39.0	38.8	-0.2	±1.1
34.0	33.9	-0.1	±1.1
33.0	32.0	0.0	±1.1
32.0	32.0	0.0	±1.1
31.0	31.1	0.1	±1.1
30.0	30.2	0.2	±1.1

Function : 8. Level Linearity including level range control

8.1 Level Linearity including the Level Range (Reference Signal)

Range	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
20-100	94.0	94.0	0.0	±1.1
20-110	94.0	94.0	0.0	±1.1
30-120	94.0	94.0	0.0	±1.1
40-130	94.0	94.0	0.0	±1.1

8.2 Level Linearity including the Level range (5dB Above Under-range)

Range	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
20-80	25.0	25.4	0.4	±1.1
20-90	25.0	25.4	0.4	±1.1
20-100	25.0	25.5	0.5	±1.1
20-110	25.0	25.3	0.3	±1.1
30-120	35.0	35.0	0.0	±1.1
40-130	45.0	45.0	0.0	±1.1

Certificate No.: CP20240127EA

Calibration Report

Function : 9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	116.0	0.0	±1.0
	2	98.9	-0.1	+1.0 ; -2.5
	0.25	89.8	-0.2	+1.5 ; -5.0
Slow	200	109.4	-0.2	±1.0
	2	89.8	-0.2	+1.0 ; -5.0
	0.25	109.9	-0.1	±1.0
LAE	2	90.0	0.0	+1.0 ; -2.5
	0.25	80.8	-0.2	+1.5 ; -5.0

Function : 10. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	125.4	125.3	-0.1	±3.0
Positive half cycle	124.4	124.2	-0.2	±2.0
Negative half cycle	124.4	124.2	-0.2	±2.0

Function : 11. Overload indication

Positive one-half cycle	Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
	Negative one-half cycle			
-	-	-	-	-

Function : 12. High-Level Stability

High-Level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	129.0	129.0	0.0	±0.3

Certificate No.: CP20240127EA

Calibration Report

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Level Linearity including level range control	0.30	0.30
9) Tone burst response	0.20	0.30
10) Peak C sound level	0.20	0.35
11) Overload indication	0.20	0.25
12) High-Level Stability	0.10	0.10

Remarks: 1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
2. Overload indication can not measured because sound level meter can not set to Reference value of the standard calibration.
3. The acceptance limit is for the deviated value.
4. Acceptance limits was IEC61672-3:2013 Class 2.
5. The coverage factor $k = 2.00$

-- End of Report --



CERTIFICATE OF CALIBRATION

NO. 20240313388

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	821488
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-03-22
Due Date:	2025-03-21



Calibrated by:

Jim Lin

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

1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-60237

4. Measuring up limits: 140 dBA

3. Adjustments to Indicated sound levels:
Type of Calibrator: B&K 4231
Sound Pressure Level: 94.0 dB

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

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

Nominal frequency / Hz	Frequency weighting / dB			Nominal frequency / Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-70.6	-14.6	-0.9	1000	0.1	0.0	0.0
20	-50.1	-6.1	-0.2	2000	1.3	-0.1	0.0
31.5	-39.5	-2.9	-0.2	4000	1.2	-0.7	0.0
63	-26.2	-0.8	-0.1	8000	-1.1	-3.0	0.0
125	-16.1	-0.1	0.0	12500	-6.0	-7.9	-0.1
250	-8.6	0.0	0.0	16000	-11.7	-13.7	0.0
500	-3.2	0.0	-0.1	20000	-23.8	-25.8	-0.3

6. Self-generated noise

Microphone replaced by electrical input signal device

7.2 dB(A)	6.8 dB(C)	14.0 dB(Z)
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7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.2
Rate of the S weighting decrease (dB/s)	4.4
Deviation of F&S	0.0

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

Reference sound level 90.0 dB

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

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

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

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

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB		
	L _{max} -L _a	L _{max} -L _a	L _{max} -L _a
500	0.0	-4.0	-2.9
200	-1.0	-7.4	-6.9
2	-18.2	-26.9	-26.9
0.25	-27.1	/	-36.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LCpeak-LC(dB)	3.4	3.5	2.4	2.4	2.4	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

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

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

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

Environment conditions:

Air temperature: 25 °C
 Relative humidity: 60 %
 Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2025-12-15	NML
Multi function sound calibrator	B&K 4226	2289444	2025-10-15	CIGISMEC
Signal generator	DS 360	33873	2025-10-15	CEPREI

Test specifications:

- All Scairlet's Sound level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of $\pm 20\%$.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

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



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): 705.1
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: 1.56304
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 Slope	Linear Regression Intercept	Linear Regression Corr. Coeff.	# of Observations
1	7.50	1.678	59.7	57.58	35.4041	-2.1709	0.9834	5
2	6.30	1.539	55.4	53.43				
3	5.20	1.399	47.9	46.20				
4	4.50	1.302	43.7	42.15				
5	3.10	1.112	40.1	38.68				

Calculations

$$Qstd = 1/m \sqrt{(H2O(Pa/Pstd)(Tstd/Ta)) - b}$$

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

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:

$$1/m(I) \sqrt{(298/Tav)(Pav/760)) - b}$$

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

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: 1.56304
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 Slope
1	7.80	1.705	60.1	57.76	28.1557
2	6.00	1.497	57.2	54.97	11.0629
3	5.30	1.407	53.4	51.32	
4	4.50	1.297	49.7	47.77	0.9717
5	3.90	1.209	45.6	43.83	
					# of Observations: 5

Calculations

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

Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg

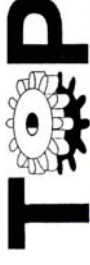
For subsequent calculation of sampler flow:

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

Enter Average 1 (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

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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: 1.56304
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 Slope
1	7.80	1.827	61.5	63.34	31.5959
2	6.70	1.694	57.7	59.43	5.8641
3	5.90	1.590	54.3	55.93	
4	4.40	1.374	49.5	50.98	0.9885
5	3.80	1.278	43.6	44.91	
					# of Observations: 5

Calculations

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

Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

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

Enter Average 1 (chart): 53.3
Average Flow Calculation m3/min 1.434856906
Average Flow Calculation in cfm 50.6685053
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

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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.
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	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 1.1115
5	4.60	0.901	39.6	26.05	SSP 51.87

of Observations: 5

Calculations

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

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

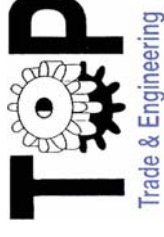
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)

Ts = Average temperature (deg K)
Ps = Average pressure (mm Hg)

For subsequent calculation of sampler flow:

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

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



PM10 High Volume Sampler Verification

Site Information

Location: – Site ID: – Date: 2 October 2023
Sampler: TE-6070 PM10 Serial No: 3245 Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 27.50
Corrected Pressure (mm Hg): 698.5
Temperature (deg F): 75.2
Temperature (deg K): 297.0
Average Press. (in Hg): 26.48
Corrected Average (mm Hg): 672.6
Average Temp. (deg F): 76.0
Average Temp. (deg K): 297.4

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	9.35	1.269	60.0	39.12	Slope 36.6800
2	7.65	1.149	55.4	36.12	Intercept -6.6541
3	6.55	1.064	50.9	33.19	Corr. Coeff 0.9908
4	5.70	0.993	45.5	29.67	SFR 1.0986
5	4.65	0.898	39.4	25.69	SSP 50.91

of Observations: 5

Calculations

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

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

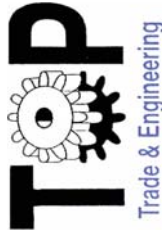
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)

Ts = Average temperature (deg K)
Ps = Average pressure (mm Hg)

For subsequent calculation of sampler flow:

Average I (chart): 50.2
Average Flow over Sample (m3/min) 1.091533108
Enter Total Time (Hrs): 24.0
Total flow over sample (m3/min) 1571.807676
Total flow over sample (CFM) 55500.52903

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



PM10 High Volume Sampler Verification

Site Information

Location: - Site ID: - Date: 2 October 2023
Sampler: TE-6070 PM10 Serial No: 3211 Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 27.10
Corrected Pressure (mm Hg): 688.3
Temperature (deg F): 75.3
Corrected Temperature (deg K): 297.0
Average Press. (in Hg): 26.55
Average Temp. (deg F): 76.2
Average Temp. (deg K): 297.6

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	# of Observations:
1	9.60	1.295	60.7	39.87	Slope 34.8028	5
2	7.50	1.146	55.5	36.46	Intercept -4.2838	
3	6.45	1.063	50.8	33.37	Corr. Coeff 0.9827	
4	5.35	0.969	45.9	30.15	SFR 1.105	
5	4.60	0.900	39.2	25.75	SSP 52.02	

Calculations

$Qa = 1/m(\sqrt{r(H2O)}(Ta/Pa))-b$
 $IC = I(\sqrt{r(Ta/Pa)})$
 $SFR = 1.13(Ps/Pa)(Ta/Ts)$
 $SSP = (m*SFR+b)/(\sqrt{r(Pa/Ta)})$
 $SFR = \text{sampler set point flow rate}$
 $SSP = \text{sampler chart set point}$
 $m = \text{sampler slope}$
 $b = \text{sampler intercept}$
 $Ta = \text{actual temperature (deg K)}$
 $Pa = \text{actual pressure (mm Hg)}$
 $Ts = \text{Average temperature (deg K)}$
 $Ps = \text{Average pressure (mm Hg)}$
 $Qa = \text{actual flow rate}$
 $IC = \text{corrected chart response}$
 $m = \text{calibrator slope}$
 $b = \text{calibrator intercept}$
 $Ta = \text{actual temperature (deg K)}$
 $Pa = \text{actual pressure (mm Hg)}$
 $Ts = \text{Average temperature (deg K)}$
 $Ps = \text{Average pressure (mm Hg)}$
For subsequent calculation of sampler flow:

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

Average I (chart): 50.4
Average Flow over Sample (m3/min)
1.085070646
Enter Total Time (Hrs): 24.0
Total flow over sample (m3/min)
1562.501731
Total flow over sample (CFM)
55171.9361

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Certificate of Analyzer Performance Testing

Calibrated Date : 26-Aug-23 Certificate No. : 0823-001 Page : 1/1

Analyzer Instruments

Analyzer Type : NO/NOx/NOx Analyzer Manufacturer : Thermo Environmental
Model : 42C Serial No. : 66193-351

Environmental

Temperature : 25.3 °C
Humidity : 40.2 %RH

Calibration System

Calibrator Units : Thermo Environmental Zero Air Generator : API
Model : 146C Model : 701
Serial No. : 514811458 Serial No. : 179

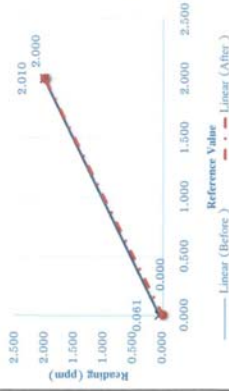
Standard Gas

NO Conc. : 2 ppm Cylinder No. : CC750227
SO2 : 2 ppm Expire Date : 21-Nov-23
CO Conc. : 50 ppm

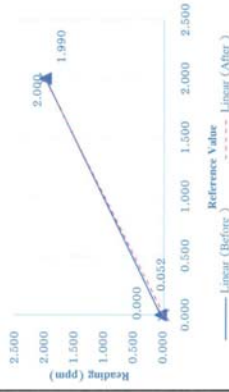
Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
NO	0.061	0.000	0.06	2.01	2.00	0.50
NOx	0.052	0.000	0.05	1.99	2.00	-0.50
NO	0.000	0.000	0.00	2.00	2.00	0.00
NOx	0.000	0.000	0.00	2.00	2.00	0.00

Single point calibration (NO)



Single point calibration (NOx)



Calibrated by :
(Mr. Tong Pima)

Certificate of Analyzer Performance Testing

Calibrated Date : 1-Jul-24 Certificate No. : 0724-001 Page : 1/1

Analyzer Instruments
 Analyzer Type : NO/NO_x/NO_x Analyzer
 Model : 42C
 Manufacturer : Thermo Environmental
 Serial No. : 02470-229

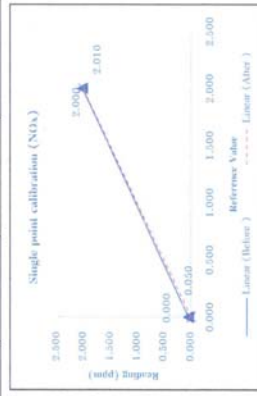
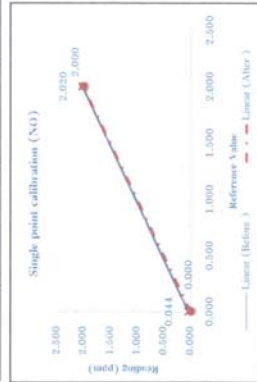
Environmental
 Temperature : 26.3 °C
 Humidity : 42.5 %RH

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. : 307199
 Expire Date : 10-Oct-25

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
NO	0.044	0.000	0.04	2.02	2.00	1.00
	0.050	0.000	0.05	2.01	2.00	0.50
NO _x	0.000	0.000	0.00	2.00	2.00	0.00
	0.000	0.000	0.00	2.00	2.00	0.00



Calibrated by : *Tan*
 (Mr. Tong Pina)

Certificate of Analyzer Performance Testing

Calibrated Date : 8-Mar-24 Certificate No. : 0324-006 Page : 1/1

Analyzer Instruments
 Analyzer Type : NO/NO_x Analyzer
 Model : 42C
 Manufacturer : Thermo Environmental
 Serial No. : 58926-220

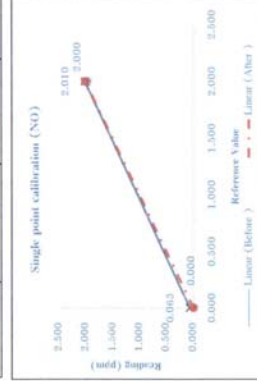
Environmental
 Temperature : 25.7 °C
 Humidity : 44.6 %RH

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. : 307199
 Expire Date : 10-Oct-25

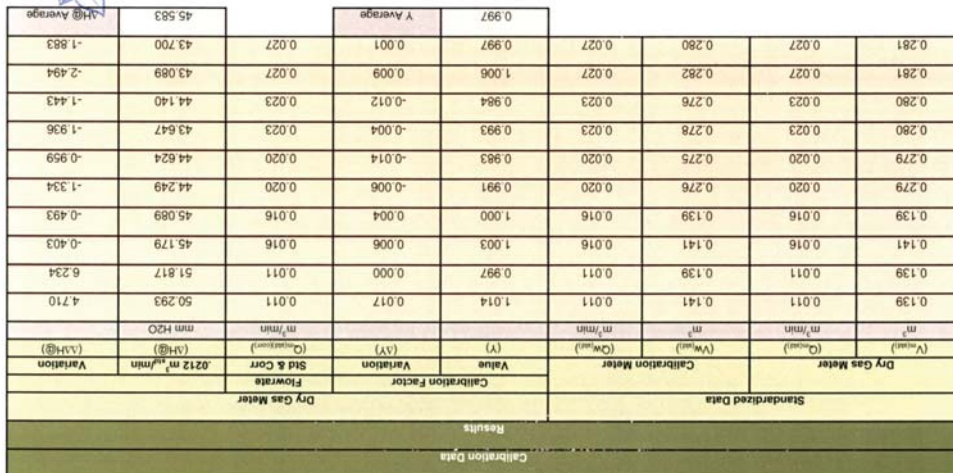
Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
NO	0.063	0.000	0.06	2.01	2.00	0.50
	0.051	0.000	0.05	1.99	2.00	-0.50
NO _x	0.000	0.000	0.00	2.00	2.00	0.00
	0.000	0.000	0.00	2.00	2.00	0.00



Calibrated by : *Tan*
 (Mr. Tong Pina)

6-007-23

[illegible]E-mail : info@earthland.com

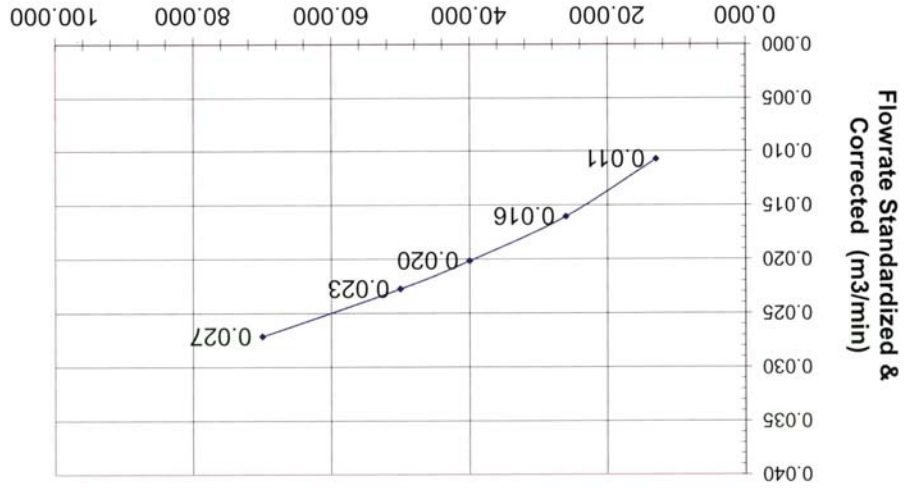
Run Time	Calibration Data				Calibration Meter			
(e) Elapsed	DGM Orifice	mm H ₂ O	m ³ (V ₀)	m ³ (V ₁)	Metering Console		Calibration Data	
					Volume Final	Volume Initial	Outlet Temp	Outlet Temp
13.07	13.0	0.0000	0.1401	0.1401	22	22	543 141380	543 283420
13.07	13.0	0.1401	0.2801	0.2801	23	23	543 423000	543 423000
8.78	26.0	0.2868	0.4284	0.4284	23	23	543 430700	543 572980
8.65	26.0	0.4284	0.5684	0.5684	23	24	543 572980	543 713240
13.68	40.0	0.5877	0.8677	0.8677	24	25	543 732420	544 010600
13.65	40.0	0.8677	1.1477	1.1477	25	25	544 010600	544 286700
12.20	50.0	1.7392	2.0192	2.0192	25	26	544 870120	545 149120
12.17	50.0	2.0192	2.2992	2.2992	26	26	545 149120	545 425800
10.38	70.0	2.3161	2.5961	2.5961	27	27	545 442460	545 725780
10.37	70.0	2.5961	2.8761	2.8761	27	28	545 725780	546 006600

Std Temp	29.5	K
Std Press	760	mm Hg
K _i	0.386	
Console Leak Check		PASS



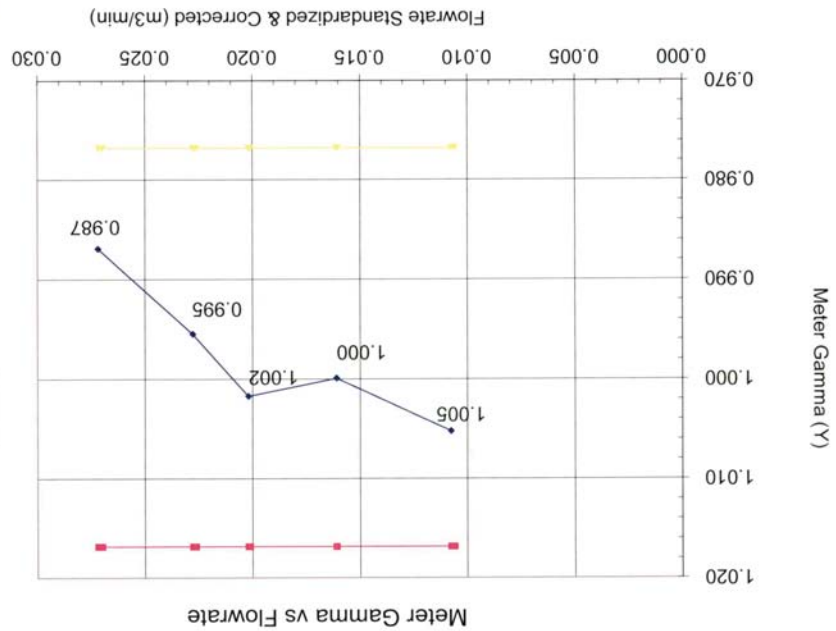


DGM Orifice ΔH (mm H₂O)



Meter Pressure vs Flowrate

Calibration Date: 6-10-2023 Calibration Reference No: SE66AP016



Calibration Date: 6-10-2023 Calibration Reference No: SE66AP016

THERMOCOUPLES SYSTEM CALIBRATION

THERMOCOUPLES SYSTEM CALIBRATION

Sampling System Equipment Information		Calibration Conditions	
Console Model Number	Date	Time	
XD-502-V		05-Oct-23	11:00 AM
Console Serial Number	1901001	Calibration Reference No.	SE68AP016
DGM Model Number	SK25EX-100B	Reference Thermometer	FLUKE 714
DGM Serial Number	20226818	Serial Number	1812153
Meter Box Model Number	TC8	Dry Box Calibrator	Pyros 650
Meter Box Serial Number	181213-02	Serial Number	K3811

Calibration Conditions		
Date	Time	
05-Oct-23		11:00 AM
Calibration Reference No.	SE66AP016	
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	26	39	95	150	261	372	482	594	817	1040
Filter	-17	26	39	95	150						
Aux	-17	26	39	95	150						
Probe	-17	26	39	95	150						
Oven	-16	26	39	95	150						
Exit	-16	26	39								

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	26	39	95	150	261	372	482	594	817	1040
Filter		-17	26	39	95	150						
Aux		-17	26	39	95	150						
Probe		-17	26	39	95	150						
Oven		-16	26	39	95	150						
Exit		-16	26	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

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	296	0.70
350	350.0	348	0.32

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	296	0.70
350	350.0	348	0.32

Stack
DGM
Probe

± 1.50% Absolute
+ 3.0 °C
+ 3.0 °C

3.0 °C	3.0 °C	2.0 °C
+/-	+/-	+

Range

Tolerances Range

± 1.50% Absolute
+ 3.0 °C
+ 3.0 °C

$$\begin{array}{c} +3.0^{\circ}\text{C} \\ +3.0^{\circ}\text{C} \\ +2.0^{\circ}\text{C} \end{array}$$

Calibrated by :

Kiathawin

Approved by :

Approved by :

Kiathawin

Trudi! Sam Hatcher

PITOT TUBE CALIBRATION

Sampling System Equipment Information		Calibration Conditions		
Console Model Number	XD-502-V	Date	06-Oct-23	9:00 AM
Console Serial Number	1901001	Calibration Reference No.	SE6AP016	
DGM Model Number	SK25EX-100B	Barometric Pressure	759	mm Hg
DGM Serial Number	20226818	Pitot Tube Type	S	
Pitot tube Number	A7637	Size (OD)	3/8	inch
		Standard Pitot Tube ID Number	160-12	
		C _p (std)	0.99	

Results				
"A" SIDE CALIBRATION				
RUN No.	Ap std mm H ₂ O	Ap (s) mm H ₂ O	Cp (s)	DEVIATION Cp(s)-Cp(A)
1	6.4	8.6	0.854	0.004
2	16.4	22.4	0.847	-0.003
3	30.8	42.0	0.848	-0.002
	AVERAGE	Cp (SIDE A)	0.850	0.001

"B" SIDE CALIBRATION				
Results				
RUN No.	Ap std mm H ₂ O	Ap (s) mm H ₂ O	Cp (s)	DEVIATION Cp(s)-Cp(B)
1	6.4	8.8	0.844	0.002
2	16.4	22.8	0.840	-0.003
3	30.8	42.4	0.844	0.001
	AVERAGE	Co (SIDE B)	0.843	-0.001

$[CpA(SIDE A) - Cp(SIDE B)] = 0.007$

Note: Average deviation must be < 0.01



Calibrated by: Kiatka win

Approved by : _____

Environmental Solution Integrator Co., Ltd.

NOZZLE CALIBRATION

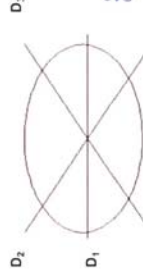
Sampling System Equipment Information		Calibration Conditions	
Console Model Number	Date	Time	
Console Serial Number	1901001	Calibration Reference No.	SE66AP016
DGM Model Number	SK25EX-100B	Barometric Pressure	759
DGM Model Number	20226818	Calibration	Vernier 0-150mm
DGM Serial Number		Method Reference	US EPA Method
Nozzle Types			0.01 mm increments
			mm hg
			9:00 AM

Nozzle ID	Calibration Data						Different	Results $(D_1 + D_2 + D_3) / 3$
	Nozzle Diameter		D ₂		D ₃			
	Sizes	mm	mm	mm	mm	mm		
4	3.0	2.84	2.86	2.85	mm	mm	mm	2.850
5	3.9	3.94	3.95	3.94	3.94	3.94	0.006	3.943
6	4.6	4.57	4.55	4.56	0.010	0.010	0.006	4.560
8	6.2	6.13	6.15	6.17	6.15	6.17	0.020	6.150
9	7.0	6.70	6.73	6.74	0.021	0.021	0.015	6.723
12	9.4	9.48	9.47	9.50	9.48	9.50	0.012	9.483
14	10.9	10.74	10.72	10.74	10.72	10.74	0.015	10.733

Where :

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

$$D_{avg} = (D_1 + D_2 + D_3) / 3$$


Calibrated by :

Kiatakwin

Approved by :

Penadig Sangkhom

Certificate No.: G 670220
Date of issue : 25-Mar-24



Instrument description : Flue Gas Analyzer
Instrument model : Testo 350 New
Control unit serial no. : 02851631/410
Instrument serial no. : 60266391/410
ID no. or control no. : -
Manufacturer : Testo SE & Co. KGaA
Probe description : -
Probe model : -
Probe serial no. : -
Customer name : C.E.M. Technology (Thailand) Co., Ltd
Customer address : 31/8 Phuthamonthon Sai 5, Moo 13, Rai Khing, Sam Phran, Nakhon Pathom 73210

Total pages of certificate : 2 Pages
Receiving no. : L-241144
Receiving date. : 21-Mar-24
Parameter of calibration : Gas Calibration(Oxygen 2.50,10.04,21.02 %vol, Carbon Monoxide 80.14,302,1003 ppm, Nitrogen Dioxide 81.32 ppm, Nitric Oxide 151.5 ppm, Sulphur Dioxide 100.8 ppm)

Condition of UUC. : Used
Ambient condition : All of the Measurement were carried out the stabilized laboratory
Temperature : 23 ± 5 °C
Humidity : 55 ± 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Lakso, Bangkok 10210 THAILAND
Calibration procedure no. : This instrument was calibrated by comparison with Standard gas mixture according to calibration Work Instruction no. WI-CL-28-C

*The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measured multiplied by coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.
This certificate is applied only to item under test Environmental condition.
This Calibration Certificate may not be reproduced other than in full except with the permission of the issuing laboratory.
Calibration certificates without signature and seal not valid and The results relate only to the items tested/calibrated.
This calibration certificate documents are traceability to national standards, which realize measurement according to the International System of Units (SI).*

Date of calibration : 25-Mar-24

Kumthorn K.
Mr. Kwanchai Khamdang
Calibration Technician

D. Wilton
Mrs. Nongluck Wongsettee
Technical Manager

Certificate No.: G 670220



Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.50 % Vol	2412/23	Linde	27-Aug-27
Oxygen (O ₂) 10.04 % Vol	CG-0153-21	Nint	18-Nov-26
Oxygen (O ₂) 21.02 % Vol	CG-0041-22	Nint	10-Feb-27
Carbon monoxide (CO) 80.14 ppm	CG-0040-22	Nint	14-Feb-27
Carbon monoxide (CO) 302 ppm	1915/23	Linde	16-Jun-25
Carbon monoxide (CO) 1003 ppm	2584/23	Linde	10-Sep-25
Nitrogen Dioxide (NO ₂) 81.32 ppm	3546/23	Linde	14-Jan-26
Nitric Oxide (NO) 151.5 ppm	0161/23	Linde	22-Jan-25
Sulphur Dioxide (SO ₂) 100.8 ppm	3507/22	Linde	09-Nov-24

Measured room conditions

Temperature : 22.9 °C Humidity : 64.7 %RH Pressure : 1011.3 mbar
Gas Temperature : 23 °C Flow rate : 1,300 ml/min Gas pressure : 1015.8 mbar

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.50	2.48	-0.02	0.15
O ₂ (%Vol)	10.04	9.94	-0.10	0.20
O ₂ (%Vol)	21.02	21.12	0.10	0.30
CO (ppm)	80.14	82	1.86	3.0
CO (ppm)	302	304	2	6.0
CO (ppm)	1003	1006	3	12
*NO ₂ (ppm)	81.32	82.2	0.88	8.0
*NO (ppm)	151.5	152	0.5	8.0
*SO ₂ (ppm)	100.8	101	0.2	6.0

Remark : 1 cmol/mol = 1 %vol, 1 µmol/mol = 1 ppm.

* Calibrations marked Not TISI Accredited "in this Certificate have been included for completeness."

End of Report