

ภาคผนวกที่ 4

สรุปเอกสารสอบเทียบอุปกรณ์เครื่องมือ

เอกสารการสอบเทียบเครื่องมือตรวจวัดระดับเสียงในบรรยากาศ

CERTIFICATE OF CALIBRATION

Certificate No. : 66S1031-25

Job No. : 66S1031

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 : ACO

Relative humidity : (50 ± 15) %

Model : 6236

Atmospheric pressure : -

Serial No. : 222128

Date of received : 26-Oct-2023

Identity No. : NS-03-013

Date of calibration : 30-Oct-2023

Range : See to Data

Date of issued : 01-Nov-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 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	94.0	0.0	0.20
	104	104.0	0.0	0.20
	114	114.0	0.0	0.20
C	94	94.0	0.0	0.20
	104	104.0	0.0	0.20
	114	114.0	0.0	0.20
Z	94	93.9	-0.1	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. : 66S1031-24

Job No. : 66S1031

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. : 222129

Identity No. : NS-03-014

Range : See to Data

Ambient temperature : (20 ± 2) °C

Relative humidity : (50 ± 15) %

Atmospheric pressure : -

Date of received : 26-Oct-2023

Date of calibration : 30-Oct-2023

Date of issued : 01-Nov-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 Phanangkaew (MD)

Reviewed By : [] Mr. Sompong Srisert

[] Mr. Boonyarit Auejirakarn

[x] 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	94.1	0.1	0.20
	104	104.2	0.2	0.20
	114	114.2	0.2	0.20
C	94	94.1	0.1	0.20
	104	104.1	0.1	0.20
	114	114.1	0.1	0.20
Z	94	94.1	0.1	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. : 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 :

[] 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	94.0	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. : 66S0420-21

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

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

Manufacturer : ACO

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

Model : 6236

Atmospheric pressure : -

Serial No. : 222191

Date of received : 30-Mar-2023

Identity No. : NS-03-021

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 : 

[] 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 -

校正証明書

CALIBRATION CERTIFICATE

品名 PRODUCT NAME : 普通騒音計
Sound Level Meter
型式 TYPE : 6236
器物番号 PRODUCT NUMBER : 222191
マイク MICROPHONE : 84155
製造者 MANUFACTURER : 株式会社アコー ACO CO., LTD.

※特記事項

[基準器、校正機器のトレーサビリティ証明]

校正に使用した基準器、校正機器は国家基準にトレーサブル
であることを証明致します。

※Special notes

[Traceability certificate of standard instruments and calibration equipment.]

We certify that the standard instruments and calibration equipment
are traceable to the national standards.

2022年3月3日

March 3, 2022


東京都世田谷区代沢2-6-10
株式会社アコー
代表取締役 寺園信一
2-6-10 Daizawa Setagaya-ku
Tokyo Japan
President : Shinichi Terazono
ACO CO., LTD.

1 試験成績 Test Results

別紙試験成績表添付 Test results are attached as an exhibit.

2 試験条件 Test Requirements

試験日 Test date : 2022年3月3日 March 3, 2022
温度 Temperature : 24 °C
湿度 Humidity : 40 %
気圧 Barometric pressure : 990 hPa

3 使用機器 Used Equipment

デジタル・マルチメータ Digital Multimeter 34401A No. MY45039877
(有効期間 : 2021年3月から2022年3月)
(Effective life : from March, 2021 to March, 2022)

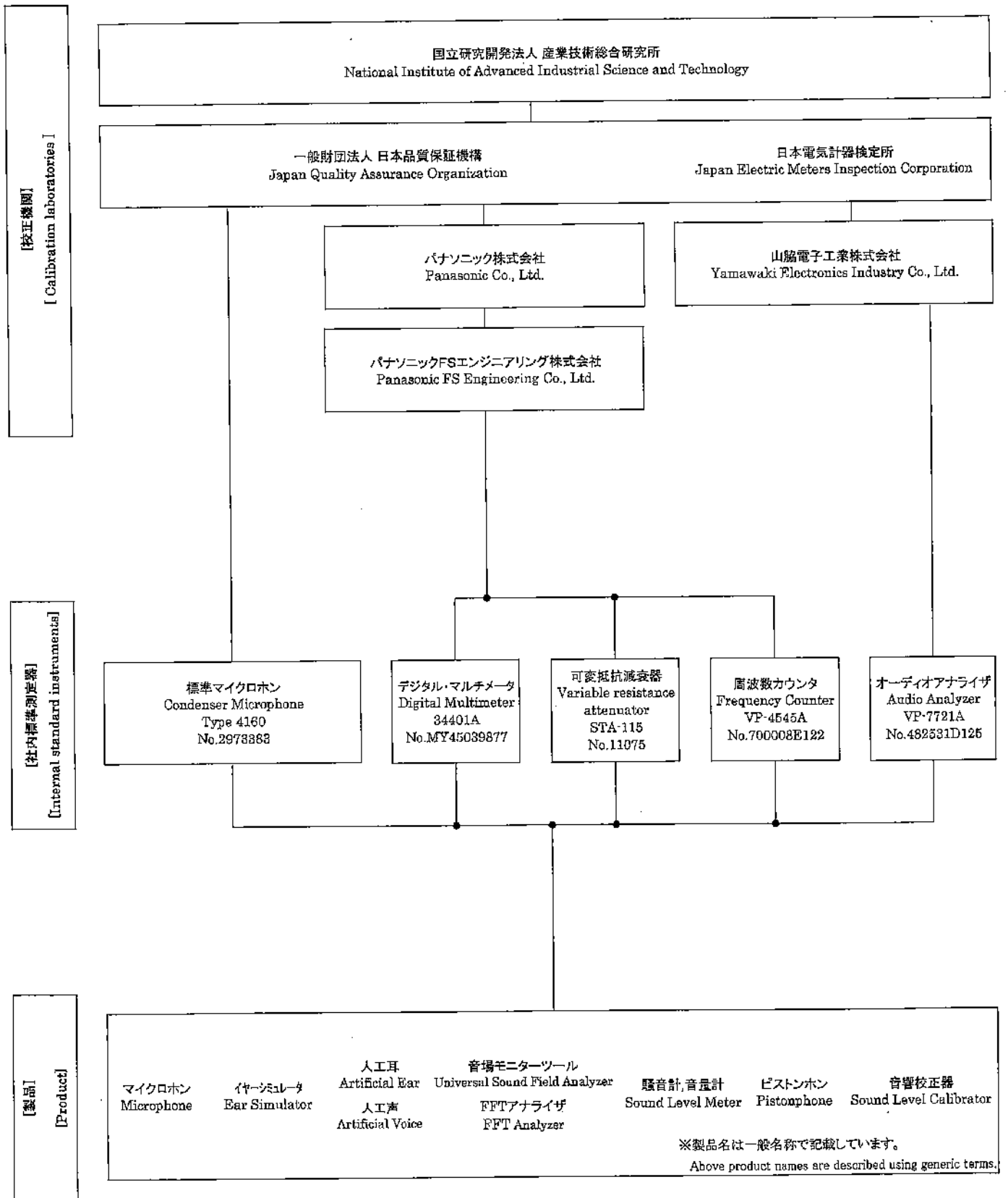
可変抵抗減衰器 Variable resistance attenuator STA-115 No. 11075
(有効期間 : 2021年3月から2022年3月)
(Effective life : from March, 2021 to March, 2022)

周波数カウンタ Frequency Counter VP-4545A No. 700008E122
(有効期間 : 2021年3月から2022年3月)
(Effective life : from March, 2021 to March, 2022)

オーディオアナライザ Audio Analyzer VP-7721A No. 482531D125
(有効期間 : 2021年3月から2022年3月)
(Effective life : from March, 2021 to March, 2022)

標準マイクロホン Condenser Microphone 4160 No. 2973383
(有効期間 : 2021年7月から2023年7月)
(Effective life : from July, 2021 to July, 2023)

トレーサビリティ体系図 Traceability Flow Chart



普通騒音計
Sound Level Meter
TYPE 6236
検査成績書
INSPECTION CERTIFICATE

本体製造番号
Serial No. of body: 222191
マイクロホン製造番号
Serial No. of Microphone: 84155

Ver:5.0 22-01-08

年月日: 2022年3月3日

Date: March 3, 2022

承認 Approved	点検 Passed	担当 Inspected
<i>A. Nagato</i>	<i>Y. Nagome</i>	<i>K. Nakata</i>

株式会社 アコー
ACO CO., LTD.

1. 検査年月日 Inspection Date

2022年3月3日

March 3, 2022

2. 検査条件 Inspection Condition

- 1) 温度 Temperature : 24 °C
 2) 湿度 Humidity : 40 %
 3) 気圧 Barometric pressure : 990 hPa

3. 検査項目及び結果 Inspection Results

1) RANGE 切換誤差検査 The RANGE Shifting Error

RANGE : 20-100dB 70dB 入力基準 ± 0.7 dB以下Within ± 0.7 dB of the value at 70dB input, Range 20-100dB.

RANGE (dB)	入力レベル Input level (dB)	周波数 Frequency (Hz)		
		31.5	1000	8000
20-80	70	-0.1	-0.1	0.0
20-90	70	0.0	0.0	0.0
20-100	70	0.0	0.0	0.0
20-110	70	0.0	0.1	0.1
30-120	70	-0.1	-0.1	0.0
40-130	70	-0.2	-0.2	-0.1
判定	Passed	Pass		

2) 安定性特性検査 Stability Characteristic

RANGE : 20-100dB 1分後基準 ± 0.5 dB以下Within ± 0.5 dB of the value one minute later, Range 20-100dB.

	10分後 ten minutes later
誤差 Error (dB)	0.0
判定 Passed	Pass

3) 目盛誤差特性検査 The Scale Error

RANGE : 30-120dB 31.5Hzは75.0dB入力基準 1kHz、8kHzは95dB入力基準

31.5Hz is 75.0dB input standard 1kHz, 8kHz is 95dB input standard

A特性 A weighting

A特性 A weighting

入力 Input (dB)	規格 Standard (dB)	周波数 Frequency (Hz)
		31.5
120		
115		
110		
105		
100		
95		
90		
85		
80	±0.5	0.0
75	0.0	0.0
70	±0.5	-0.1
65	±0.5	-0.2
60	±0.5	-0.1
55	±0.5	-0.1
50	±0.5	0.0
45	±0.5	0.0
40	±0.5	-0.1
35	±0.5	0.2
30	±0.5	0.5
判定	Passed	Pass

入力 Input (dB)	規格 Standard (dB)	周波数 Frequency (Hz)	
		1000	8000
120	±0.5	0.0	0.0
115	±0.5	-0.1	0.0
110	±0.5	-0.1	-0.1
105	±0.5	-0.1	-0.1
100	±0.5	-0.1	-0.1
95	0.0	0.0	0.0
90	±0.5	-0.1	-0.1
85	±0.5	-0.1	-0.1
80	±0.5	0.1	-0.1
75	±0.5	0.1	0.2
70	±0.5	-0.1	-0.2
65	±0.5	-0.2	-0.2
60	±0.5	-0.2	-0.2
55	±0.5	-0.2	-0.2
50	±0.5	-0.2	0.0
45	±0.5	-0.1	-0.1
40	±0.5	-0.1	0.0
35	±0.5	0.0	0.0
30	±0.5	0.4	0.4
判定	Passed	Pass	

4) 動特性検査 Dynamic Characteristic

RANGE : 20-100dB 100dB、1kHz 入力基準

When 100dB input, Range 20-100dB at 1kHz.

	規格 Standard	測定 Measured Value
FAST	-1.0+0.5 -1.0 (dB)	-1.5
SLOW	-4.0±1.0 (dB)	-4.5
判定	Passed	Pass

5) 周波数特性検査 Frequency Response

RANGE : 20-100dB 95dB入力基準(マイクを含む)

When 95dB input, including Microphone value, Range 20-100dB

周波数 Frequency (Hz)	A特性			C特性			Z特性	許容差 Tolerance (dB)
	規格 Standard (dB)	レスポンス Response (dB)	偏差 Deviation (dB)	規格 Standard (dB)	レスポンス Response (dB)	偏差 Deviation (dB)	レスポンス Response (dB)	
10	-70.4	-69.2	1.2	-14.3	-12.7	1.6	-0.7	+5.0, -∞
20	-50.5	-51.0	-0.5	-6.2	-5.8	0.4	-0.2	±3.0
40	-34.6	-35.2	-0.6	-2.0	-2.2	-0.2	-0.1	±2.0
100	-19.1	-19.5	-0.4	-0.3	-0.3	0.0	-0.1	±1.5
250	-8.6	-8.8	-0.2	0.0	0.0	0.0	-0.1	±1.5
500	-3.2	-3.3	-0.1	0.0	0.1	0.1	0.0	±1.5
1000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	±1.0
2k	1.2	1.2	0.0	-0.2	-0.3	-0.1	-0.1	±2.0
4k	1.0	0.6	-0.4	-0.8	-1.4	-0.6	-0.2	±3.0
8k	-1.1	-2.1	-1.0	-3.0	-4.1	-1.1	-0.8	±5.0
10k	-2.5	-3.6	-1.1	-4.4	-5.7	-1.3	-1.2	+5.0, -∞
20k	-9.3	-10.8	-1.5	-11.2	-12.9	-1.7	-3.7	+5.0, -∞
判定 Passed		Pass						

6) 実効値指示誤差検査 波高率3のバースト信号に対して1.0dB以内

Within 1.0dB on the Burst signal of the peak factor 3, Range 20-100dB.

周波数 Frequency 2kHz、繰り返し周波数 Repeat frequency 40Hz

実効値指示誤差 Effective value Error (dB)	判定
0.3	Pass

7) 自己雑音特性検査 Self-noise

RANGE : 20-80dB

RANGE : 20-80dB (Including Microphone value)	A特性	C特性	Z特性
規格 Standard (dB)	22以下 Below 22	30以下 Below 30	32以下 Below 32
自己雑音 Self-noise (dB)	19.0	26.6	28.5
判定 Passed	Pass		

発行日：2021年3月18日

校正証明書

貴社名 株式会社 アコー

下記製品は、当社の作業規程に従って校正が行われていることを証明します。
この校正に使用した標準器は、パナソニックSNEハリエーションテクノロジー株式会社、メーカー
JEMIC(日本電気計器検定所)、JQA(日本品質保証機構)などを通じて
国家標準、またはNIST(National Institute of Standards and Technology)
などにトレーサビリティがとれています。

管 理 番 号	EMC-1 0013
品 名	デジタルマルチメータ
型 式	34401A
製 造 番 号	MY45039877
校 正 年 月 日	2021年3月18日
環 境 条 件	温度 23°C 湿度 50%
発 行 番 号	202101351

使用標準器

管理番号	型 式	製造番号	名 称	有効期限
ST-031	5700A	4635001	キャリブレータ	2021/10

〒561-0854 大阪府豊中市稲津町3丁目1番1号

パナソニックFSエンジニアリング株式会社

CS統括部 校正サービス課

校正証明書発行責任者 佐藤 信治



試験・校正成績書

(Calibration Report)

成績書番号

39710K

管理番号 (Control Number)	EMC-1 0013
品名 (Description)	デジタル・マルチメータ Digital Multimeter
製造者 (Manufacturer)	Agilent Technologies
型式 (Model Number)	34401A
製造番号 (Serial Number)	MY45039877
依頼者 (Customer)	株式会社 7コー

校正日 (Calibration Date)	2021年3月18日
温度 (Temperature)	23 °C
湿度 (Humidity)	50 %
校正者 (Calibrated by)	松嶋 宏幸
総合判定 (Judgement)	合格/Pass

承認者 (Approved by)



備考

標準器 (Standard)

管理番号
(Control Number)
ST-031

型式
(Model Number)
5700A

製造番号
(Serial Number)
4635001

名称
(Description)
キャリブ レータ

この成績書に記載する標準器は国家標準にトレーサブルである。

パナソニックFSエンジニアリング株式会社

試験・校正成績書

型式 34401A 製造番号 MY45039877 管理番号 EMC-1 0013

DC V

レンジ /Range	標準入力 /Input	下限 /Lower Limit	測定値 /Measured Value	上限 /Upper Limit	判定 /Result
100 mV	100 mV	99.991 5 mV	100.000 0 mV	100.008 5 mV	PASS
1 V	0.2 V	0.199 985 V	0.199 998 V	0.200 015 V	PASS
1 V	0.4 V	0.399 977 V	0.399 998 V	0.400 023 V	PASS
1 V	0.6 V	0.599 969 V	0.599 998 V	0.600 031 V	PASS
1 V	0.8 V	0.799 961 V	0.799 998 V	0.800 039 V	PASS
1 V	1.0 V	0.999 953 V	0.999 995 V	1.000 047 V	PASS
1 V	-0.2 V	-0.200 015 V	-0.200 000 V	-0.199 985 V	PASS
1 V	-0.4 V	-0.400 023 V	-0.400 000 V	-0.399 977 V	PASS
1 V	-0.6 V	-0.600 031 V	-0.599 999 V	-0.599 969 V	PASS
1 V	-0.8 V	-0.800 039 V	-0.799 998 V	-0.799 961 V	PASS
1 V	-1.0 V	-1.000 047 V	-0.999 997 V	-0.999 953 V	PASS
10 V	10 V	9.999 60 V	9.999 89 V	10.000 40 V	PASS
100 V	100 V	99.994 9 V	100.000 2 V	100.005 1 V	PASS
1000 V	1000 V	999.945 V	999.994 V	1 000.055 V	PASS

AC V

周波数 /Frequency	レンジ /Range	標準入力 /Input	下限 /Lower Limit	測定値 /Measured Value	上限 /Upper Limit	判定 /Result
400 Hz	100 mV	100 mV	99.900 0 mV	100.086 5 mV	100.100 0 mV	PASS
400 Hz	1 V	1 V	0.999 100 V	1.000 830 V	1.000 900 V	PASS
400 Hz	10 V	10 V	9.991 00 V	10.008 48 V	10.009 00 V	PASS
400 Hz	100 V	100 V	99.910 0 V	99.991 4 V	100.090 0 V	PASS
400 Hz	750 V	700 V	699.355 V	699.873 V	700.645 V	PASS

OHMS (4W)

レンジ /Range	標準入力 /Input	下限 /Lower Limit	測定値 /Measured Value	上限 /Upper Limit	判定 /Result
100 Ω	100 Ω	99.986 0 Ω	100.007 0 Ω	100.014 0 Ω	PASS
1 kΩ	1 kΩ	0.999 890 kΩ	1.000 050 kΩ	1.000 110 kΩ	PASS
10 kΩ	10 kΩ	9.998 90 kΩ	10.000 50 kΩ	10.001 10 kΩ	PASS
100 kΩ	100 kΩ	99.989 0 kΩ	100.003 7 kΩ	100.011 0 kΩ	PASS
1 MΩ	1 MΩ	0.999 890 MΩ	1.000 033 MΩ	1.000 110 MΩ	PASS
10 MΩ	10 MΩ	9.995 90 MΩ	9.998 69 MΩ	10.004 10 MΩ	PASS
100 MΩ	100 MΩ	99.190 0 MΩ	100.797 8 MΩ	100.810 0 MΩ	PASS

DC I

レンジ /Range	標準入力 /Input	下限 /Lower Limit	測定値 /Measured Value	上限 /Upper Limit	判定 /Result
10 mA	10 mA	9.993 00 mA	9.999 19 mA	10.007 00 mA	PASS
100 mA	100 mA	99.945 0 mA	99.987 8 mA	100.055 0 mA	PASS
1 A	1 A	0.998 900 A	0.999 788 A	1.001 100 A	PASS
3 A	1 A	0.998 20 A	0.999 84 A	1.001 80 A	PASS

AC I

周波数 /Frequency	レンジ /Range	標準入力 /Input	下限 /Lower Limit	測定値 /Measured Value	上限 /Upper Limit	判定 /Result
400 Hz	1 A	1 A	0.998 600 A	1.000 244 A	1.001 400 A	PASS
400 Hz	3 A	1 A	0.996 70 A	1.000 08 A	1.003 30 A	PASS

発行日：2021年3月18日

校正証明書

貴社名 株式会社 アコー

下記製品は、当社の作業規程に従って校正が行われていることを証明します。
この校正に使用した標準器は、パナソニックSNEハリエーションテクノロジー株式会社、メーカー
JEMIC(日本電気計器検定所)、JQA(日本品質保証機構)などを通じて
国家標準、またはNIST(National Institute of Standards and Technology)
などにトレーサビリティがとれています。

管	理	番	号	EMC-1 0006
品		名		可変抵抗減衰器
型		式		STA-115
製	造	番	号	11075
校	正	年	月	日
環	境	条	件	温度 23°C 湿度 50%
発	行	番	号	202101355

使用標準器

管理番号	型 式	製造番号	名 称	有効期限
ST-031	5700A	4635001	キャリブレータ	2021/10
EO-027	URE3	101273	RMS/PEAK 電圧計	2021/3

〒561-0854 大阪府豊中市稲津町3丁目1番1号

パナソニックFSエンジニアリング株式会社

CS統括部 校正サービス課


校正証明書発行責任者 佐藤 信治



試験・校正成績書

(Calibration Report)

成績書番号 39711K

管理番号 (Control Number)	EMC-1 0006
品名 (Description)	可変抵抗減衰器 Variable resistance attenuator
製造者 (Manufacturer)	TOKYO KO-ON DENPA
型式 (Model Number)	STA-115
製造番号 (Serial Number)	11075
依頼者 (Customer)	株式会社 7コ-
校正日 (Calibration Date)	2021年3月18日
温度 (Temperature)	23 °C
湿度 (Humidity)	50 %
校正者 (Calibrated by)	水澤 和弘
総合判定 (Judgement)	合格/Pass
承認者 (Approved by)	
備考	

標準器 (Standard)

管理番号 (Control Number)	型式 (Model Number)	製造番号 (Serial Number)	名称 (Description)
ST-031	5700A	4635001	キャリブレータ
E0-027	URE3	101273	RMS/PEAK 電圧計

この成績書に記載する標準器は国家標準にトレーサブルである。

パナソニック F S エンジニアリング株式会社

試験・校正成績書

型式 STA-115 製造番号 11075 管理番号 EMC-1 0006

減衰確度/Attenuation accuracy

周波数 /Frequency	ステップ /Step	ダイヤル /Dial	下限 /Lower Limit	校正値 /Calibration Value	上限 /Upper Limit	判定 /Result
1 kHz	0.1 dB	0 dB		0.0 (REF.) dB		
1 kHz	0.1 dB	0.1 dB	0.05 dB	0.10 dB	0.15 dB	PASS
1 kHz	0.1 dB	0.2 dB	0.15 dB	0.20 dB	0.25 dB	PASS
1 kHz	0.1 dB	0.3 dB	0.25 dB	0.30 dB	0.35 dB	PASS
1 kHz	0.1 dB	0.4 dB	0.35 dB	0.40 dB	0.45 dB	PASS
1 kHz	0.1 dB	0.5 dB	0.45 dB	0.50 dB	0.55 dB	PASS
1 kHz	0.1 dB	0.6 dB	0.55 dB	0.60 dB	0.65 dB	PASS
1 kHz	0.1 dB	0.7 dB	0.65 dB	0.70 dB	0.75 dB	PASS
1 kHz	0.1 dB	0.8 dB	0.75 dB	0.80 dB	0.85 dB	PASS
1 kHz	0.1 dB	0.9 dB	0.85 dB	0.90 dB	0.95 dB	PASS
1 kHz	0.1 dB	1.0 dB	0.95 dB	1.00 dB	1.05 dB	PASS
1 kHz	1 dB	1 dB	0.90 dB	1.00 dB	1.10 dB	PASS
1 kHz	1 dB	2 dB	1.90 dB	2.00 dB	2.10 dB	PASS
1 kHz	1 dB	3 dB	2.90 dB	3.01 dB	3.10 dB	PASS
1 kHz	1 dB	4 dB	3.90 dB	4.01 dB	4.10 dB	PASS
1 kHz	1 dB	5 dB	4.90 dB	5.01 dB	5.10 dB	PASS
1 kHz	1 dB	6 dB	5.90 dB	6.01 dB	6.10 dB	PASS
1 kHz	1 dB	7 dB	6.90 dB	7.01 dB	7.10 dB	PASS
1 kHz	1 dB	8 dB	7.90 dB	8.01 dB	8.10 dB	PASS
1 kHz	1 dB	9 dB	8.90 dB	9.01 dB	9.10 dB	PASS
1 kHz	1 dB	10 dB	9.90 dB	10.00 dB	10.10 dB	PASS
1 kHz	10 dB	10 dB	9.70 dB	10.02 dB	10.30 dB	PASS
1 kHz	10 dB	20 dB	19.70 dB	19.99 dB	20.30 dB	PASS
1 kHz	10 dB	30 dB	29.70 dB	29.97 dB	30.30 dB	PASS
1 kHz	10 dB	40 dB	39.70 dB	40.04 dB	40.30 dB	PASS
1 kHz	10 dB	50 dB	49.70 dB	50.08 dB	50.30 dB	PASS
1 kHz	20 dB	20 dB	19.70 dB	20.02 dB	20.30 dB	PASS
1 kHz	20 dB	40 dB	39.70 dB	40.07 dB	40.30 dB	PASS

発行日: 2021年3月18日

校正証明書

貴社名 株式会社 アコー

下記製品は、当社の作業規程に従って校正が行われていることを証明します。
この校正に使用した標準器は、パナソニックSNEソリューションテクノロジー株式会社、メーカー
JEMIC(日本電気計器検定所)、JQA(日本品質保証機構)などを通じて
国家標準、またはNIST(National Institute of Standards and Technology)
などにトレーサビリティがとれています。

管	理	番	号	EMC-1 0005
品		名		周波数カウンタ
型		式		VP-4545A
製	造	番	号	700008E122
校	正	年	月	日
環	境	条	件	温度 23°C 湿度 50%
発	行	番	号	202101454

使用標準器

管理番号	型 式	製造番号	名 称	有効期限
EO-030	FT-001S	1504010016	時間周波数遠隔校正装置	2021/6
EO-037	33250A	MY40005937	ファンクションジェネレータ	2021/9

〒561-0854 大阪府豊中市稲津町3丁目1番1号

パナソニックFSエンジニアリング株式会社

CS統括部 校正サービス課

校正証明書発行責任者 佐藤 信治



試験・校正成績書

(Calibration Report)

成績書番号

39712K

管理番号 (Control Number)	EMC-1 0005
品名 (Description)	周波数カウンタ Frequency Counter
製造者 (Manufacturer)	Panasonic
型式 (Model Number)	VP-4545A
製造番号 (Serial Number)	700008E122
依頼者 (Customer)	株式会社 7コー

校正日 (Calibration Date)	2021年3月18日
温度 (Temperature)	23 °C
湿度 (Humidity)	50 %

校正者 (Calibrated by)	水澤 和弘
総合判定 (Judgement)	合格/Pass

承認者 (Approved by)



備考

標準器 (Standard)

管理番号 (Control Number)	型式 (Model Number)	製造番号 (Serial Number)	名称 (Description)
E0-030	FT-001S	1504010016	時間周波数遠隔校正装置
E0-037	33250A	MY40005937	ファンクションジェネレータ

この成績書に記載する標準器は国家標準にトレーサブルである。

パナソニックFSエンジニアリング株式会社

試験・校正成績書

型式 VP-4545A 製造番号 700008E122 管理番号 EMC-1 0005

入力感度試験/Sensitivity (1kHz)

	入力レベル /INPUT LEVEL		OK/NG		判定 /Result
INPUT A	50 mVrms		OK		PASS
INPUT A (フリスケーラ)	25 mVrms		OK		PASS
INPUT B	50 mVrms		OK		PASS

基準時間確度試験/Timebase

エーシング 194 H		下限 /Lower Limit	測定値 /Measured Value	上限 /Upper Limit	判定 /Result
<input checked="" type="checkbox"/> 標準	10 MHz	9.999 50 MHz	10.000 00 MHz	10.000 50 MHz	PASS
<input type="checkbox"/> OPT 57	10 MHz	9.999 950 MHz	MHz	10.000 050 MHz	N/A
<input type="checkbox"/> OPT 27	10 MHz	9.999 980 MHz	MHz	10.000 020 MHz	N/A

一般動作		OK/NG		判定 /Result
DISPLAY		OK		PASS
ATT		OK		PASS
TEST		OK		PASS
Other measurement functions		OK		PASS

証明書番号： Y1557

発行年月日： 2021年 3月 18日

校正証明書

依頼者： 株式会社アコー様

製品名： オーディオアナライザ

型式名： VP-7721A

製造番号： 482531D125

校正実施日： 2021 年 3 月 18 日

上記の計測器は当社の作業標準に従って校正・試験を行い、校正作業に於ける検査または試験の結果が仕様を満足していることを証明します。

この校正・試験に使用された標準器は、日本電気計器検定所(JEMIC)、及び日本品質保証機構(JQA)など日本の公的校正機関、または米国国立標準技術研究所(NIST)など国際度量衡委員会に加盟している諸外国の公的校正機関に対してトレーサビリティが保たれております。

また、一部の測定は自然物理定数もしくは合意標準にトレースしています。

We hereby certify that the above product has been calibrated in accordance with job standard of Yamawaki Electronics Industry Co., Ltd. and that the inspection and or test results of the calibration satisfy the specification Measurement of the calibration is traceable such as JEMIC (JAPAN ELECTRIC METERS INSPECTION CORPORATION) or JQA (JAPAN QUALITY ASSURANCE ORGANIZATION) or to overseas public calibration organization participating international measurement committee such as NIST(NATIONAL INSTITUTE OF STANDARDS TECHNOLOGY).

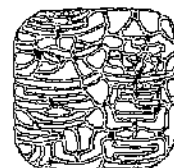
使用標準器

型式名	製造番号	製品名	有効期限
5700A	5745305	マルチファンクション校正器	2021年05月
3458A	US28027886	デジタルマルチメータ	2021年05月
53132A	MY40002181	ユニバーサルカウンタ	2021年05月
VP-7722A	590019A122	オーディオアナライザ	2021年05月
AC-12B	M-61112004	歪率計校正器	2021年05月
MG-443B	M-46748	シンセサイザ・シグネレータ	2021年05月

山脇電子工業株式会社

Yamawaki Electronics Industry Co., Ltd.

〒151-0072 東京都渋谷区幡ヶ谷1-21-7 TEL: 03-3465-2421



事前の許可なくして、この証明書の一部を複製しないでください。

yd2016-01a

This certificate shall not be reproduced except in full without the approval of Yamawaki Electronics Industry CORPORATION



試験成績書

総数 3 枚中 1 枚

管理番号 : YD-210308

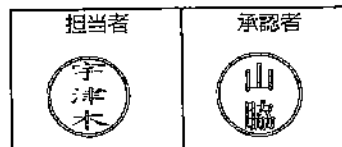
製品名 : オーディオアナライザ
型式名 : VP-7721A
製造番号 : 482531D125
製造者名 : 松下通信工業株式会社

試験年月日 : 2021 年 3 月 18 日
温度・湿度 : 23 °C 51 %RH
使用標準器 : 5700A,3458A,53132A,VP7722A
AC-12B,MG-443B

判定 : 合格

試験の結果は、下記であることを証明します。

この校正に関わる測定は、国家標準にトレーサビリティがとれています。



試験項目	規格	測定点	測定値	判定
発振部				
周波数	$\pm 3\%$ 以内 (全範囲) $\pm 2\%$ 以内 (0.16 kHz~15.99 kHz)	周波数	測定値	判定
		10 Hz	10.13 Hz	良
		20 Hz	20.25 Hz	良
		50 Hz	50.55 Hz	良
		400 Hz	404.17 Hz	良
		1 kHz	1.01 Hz	良
		20 kHz	20.031 kHz	良
		50 kHz	50.014 kHz	良
		100 kHz	99.856 kHz	良
出力振幅	± 0.5 dB (4 dB~-35.9 dB) ± 0.8 dB (-36 dB以下)	出力	測定値	判定
		4.0 dB	3.93 dB	良
		1.5 dB	1.43 dB	良
		-1.0 dB	-1.08 dB	良
		-3.5 dB	-3.58 dB	良
		-6.0 dB	-6.03 dB	良
		-16.0 dB	-16.03 dB	良
		-35.9 dB	-35.87 dB	良
		-36.0 dB	-36.05 dB	良
フラットネス	1 kHz 基準 ± 0.3 dB (全範囲) ± 0.1 dB (20 Hz~20 kHz)	周波数	測定値	判定
		10 Hz	-0.02 dB	良
		20 Hz	-0.02 dB	良
		50 Hz	-0.02 dB	良
		20 kHz	0.03 dB	良
		50 kHz	0.02 dB	良
		100 kHz	-0.03 dB	良

山脇電子工業株式会社

試験項目	規格	測定点		測定値	判定
発振部					
ひずみ率	≤0.3 % (全範囲) ≤0.005 % (30 Hz~49.9 kHz, 20 kHz~39.9 kHz) ≤0.002 % (50 Hz~19.99 kHz, 80 kHz BW)	周波数		測定値	判定
		10 Hz		0.00147 %	良
		20 Hz		0.00150 %	良
		50 Hz		0.00108 %	良
		400 Hz		0.00031 %	良
		1 kHz		0.00029 %	良
		20 kHz		0.00093 %	良
		50 kHz		0.00153 %	良
		100 kHz		0.00419 %	良
測定部					
残留雑音	<10 μV (500 kHz BW) UNBAL			測定値	判定
				4.2 μV	良
ACバール測定	ガルバールの ±3 % UNBAL	レンジ	入力電圧	測定値	判定
		100 V	100.0 V	100.1 V	良
		30 V	30.00 V	29.94 V	良
		10 V	10.00 V	10.05 V	良
		3 V	3.000 V	3.004 V	良
		1 V	1.000 V	1.001 V	良
		300 mV	300.0 mV	300.3 mV	良
		100 mV	100.0 mV	99.8 mV	良
		30 mV	30.00 mV	29.97 mV	良
		10 mV	10.00 mV	10.02 mV	良
		3 mV	3.000 mV	3.004 mV	良
		1 mV	1.000 mV	1.003 mV	良
		0.3 mV	0.300 mV	0.3005 mV	良
		0.1 mV	0.100 mV	0.1004 mV	良
フラットネス	1 kHz 基準 ±0.5 dB (20 Hz~100 kHz) ±3 dB (5 Hz~500 kHz)	周波数		測定値	判定
		10 Hz		-0.21 dB	良
		20 Hz		-0.04 dB	良
		50 Hz		0.02 dB	良
		10 kHz		-0.05 dB	良
		20 kHz		-0.07 dB	良
		50 kHz		-0.12 dB	良
		100 kHz		-0.23 dB	良
		200 kHz		-0.08 dB	良

試験項目	規格	測定点		測定値	判定	
測定部						
ひずみ率	第2高調波偏差 ±1.5 dB (5 Hz～15.99 kHz) ±2.5 dB (16 kHz～50 kHz) +2.5 dB, -4 dB (50 kHz～159.9 kHz)	周波数	レンジ	測定値	判定	
		400 Hz	- 10 dB	-9.80 dB	良	
			- 40 dB	-39.65 dB	良	
			- 60 dB	-59.40 dB	良	
		1 kHz	- 10 dB	-10.05 dB	良	
			- 40 dB	-39.95 dB	良	
			- 60 dB	-59.55 dB	良	
		20 kHz	- 10 dB	-10.95 dB	良	
			- 40 dB	-40.80 dB	良	
			- 60 dB	-60.25 dB	良	
		基本波除去比 100 dB (5 Hz～15.99 kHz) 90 dB (16 kHz～50 kHz) 86 dB (50 kHz～159.9 kHz)	周波数		測定値	判定
			400 Hz		107.0 dB	良
	1 kHz		108.0 dB	良		
	20 kHz		94.5 dB	良		
	残留雑音ひずみ率 Ein<1 V <-95 dB (10 Hz～15.99 kHz) <-85 dB (5 Hz～50 kHz) <-65 dB (50 kHz～159.9 kHz)	周波数		測定値	判定	
		10 Hz		-96.8 dB	良	
		20 Hz		-97.4 dB	良	
		1 kHz		-99.5 dB	良	
		15 kHz		-98.7 dB	良	
		50 kHz		-93.8 dB	良	
		100 kHz		-87.4 dB	良	
フィルター	検査仕様				判定	
	HPF	400 Hz	oct/-18 dB R ² 特性		良	
	LPF	30 kHz	oct/-18 dB R ² 特性		良	
		80 kHz	oct/-18 dB R ² 特性			

JCSS
JCSS 0029総数 2頁の1頁
証明書番号 1351-01114

校正証明書

依頼者	株式会社 アコー
住所	東京都世田谷区代沢2-6-10
品名	標準マイクロホン
型式	4160
製造番号	2973383
製造者	Brüel & Kjær
校正項目	音圧感度レベル
校正方法	IEC 61094-2に準拠した相互校正法を用いた音圧絶対校正
校正条件	別紙のとおり
校正実施場所	東京都八王子市南大沢四丁目4番地4 一般財団法人 日本品質保証機構 計量計測センター 計器検定課校正室
校正年月日	2021年7月8日

校正結果は次頁以降のとおりであることを証明します。

2021年7月12日

東京都八王子市南大沢四丁目4番地4
一般財団法人 日本品質保証機構
計量計測センター

所長 佐野 弘明



この証明書は、計量法第144条第1項に基づくものであり、特定標準器(国家標準)にトレーサブルな標準器により校正した結果を示すものです。

書面による承認なしに、この証明書のカラーコピー及び一部分のみを複製して使用することを禁じます。当センターは、ISO/IEC 17025:2017に基づく校正機関として認定されています。

校正結果

音圧感度レベル

周波数 (Hz)	感度レベル (dB)	周波数 (Hz)	感度レベル (dB)
20	-27.03	2000	-26.96
30	-27.06	3000	-26.69
50	-27.08	4000	-26.38
100	-27.15	5000	-26.11
125	-27.17	6000	-26.03
150	-27.21	7000	-26.30
200	-27.23	8000	-27.07
250	-27.19	9000	-28.32
300	-27.15	10000	-30.06
500	-27.13	11000	-32.07
700	-27.19	12000	-33.88
1000	-27.11	12500	-34.61
1500	-27.05		

校正の不確かさ($k=2$):

周波数	不確かさ
20 Hz以上 8000 Hz以下	0.07 dB
8000 Hz超 10000 Hz以下	0.17 dB
10000 Hz超 12500 Hz以下	0.33 dB

校正の不確かさは、包含係数 $k=2$ とした拡張不確かさであり、約95%の信頼の水準を持つと推定される区間を与える。

校正条件

1. 校正値は、1 V/Pa を0 dBとした値である。
2. 校正に使用した標準器等：
標準マイクロホン(可逆) Brüel & Kjær 4160 No.2652764
3. 偏極電圧：200 V
4. 校正結果は、下記校正室の環境条件における値である。
温度 23~24 °C 湿度 62~65 % 気圧 99.1~99.2 kPa

特記事項

校正品の受理後、修理及び調整を行わず校正を実施した。

以 上

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. Bhacharin Phanangkaew (MD)

[] 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	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 -

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

Ambient temperature : (20 ± 2) °C

Manufacturer : ACO

Relative humidity : (50 ± 15) %

Model : 6236

Atmospheric pressure : -

Serial No. : 222193

Date of received : 30-Mar-2023

Identity No. : NS-03-023

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)

[] Mr. Boonyarit Auejirakarn

[x] 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	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. : 66S0330-3

Job No. : 66S0330

Page : 1 of 2

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

Address : 31/9 Moo 13, Raikhing, Samphran,
Nakhornpathom 73210

Location : Laboratory

Equipment : Sound Level Meter

Ambient temperature : (20 ± 2) °C

Manufacturer : ACO

Relative humidity : (50 ± 15) %

Model : 6236

Atmospheric pressure : -

Serial No. : 222195

Date of received : 08-Mar-2023

Identity No. : NS-03-025

Date of calibration : 10-Mar-2023

Range : See to Data

Date of issued : 13-Mar-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

[x] Mr. Boonyarit Auejirakarn

[x] 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	94.3	0.3	0.20
	104	104.0	0.0	0.20
	114	113.7	-0.3	0.20
C	94	94.1	0.1	0.20
	104	104.0	0.0	0.20
	114	114.0	0.0	0.20
Z	94	94.3	0.3	0.20
	104	104.3	0.3	0.20
	114	114.3	0.3	0.20

UUC = Unit Under Calibration*

- The End -

CERTIFICATE OF CALIBRATION**Certificate No. :** 66S0330-1**Job No. :** 66S0330**Page :** 1 of 2**Customer :** C.E.M Technology (Thailand) Co.,Ltd.**Address :** 31/9 Moo 13, Raikhing, Samphran,
Nakhornpathom 73210**Location :** Laboratory**Equipment :** Sound Level Meter**Manufacturer :** ACO**Model :** 6236**Serial No. :** 222196**Identity No. :** NS-03-026**Range :** See to Data**Ambient temperature :** $(20 \pm 2) ^\circ\text{C}$ **Relative humidity :** $(50 \pm 15) \%$ **Atmospheric pressure :** -**Date of received :** 08-Mar-2023**Date of calibration :** 10-Mar-2023**Date of issued :** 13-Mar-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

[x] Mr. Boonyarit Auejirakarn

[x] Ms. 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	94.1	0.1	0.20
	104	103.8	-0.2	0.20
	114	113.6	-0.4	0.20
C	94	94.0	0.0	0.20
	104	103.8	-0.2	0.20
	114	113.7	-0.3	0.20
Z	94	94.0	0.0	0.20
	104	103.8	-0.2	0.20
	114	113.6	-0.4	0.20

UUC = Unit Under Calibration*

- The End -

CERTIFICATE OF CALIBRATION

Certificate No. : 66S0330-2

Job No. : 66S0330

Page : 1 of 2

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

Address : 31/9 Moo 13, Raikhing, Samphran,
Nakhornpathom 73210

Location : Laboratory

Equipment : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial No. : 222199

Identity No. : NS-03-029

Range : See to Data

Ambient temperature : (20 ± 2) °C

Relative humidity : (50 ± 15) %

Atmospheric pressure : -

Date of received : 08-Mar-2023

Date of calibration : 10-Mar-2023

Date of issued : 13-Mar-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	94.2	0.2	0.20
	104	104.2	0.2	0.20
	114	114.2	0.2	0.20
C	94	94.1	0.1	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	114.1	0.1	0.20

UUC = Unit Under Calibration*

- The End -

CERTIFICATE OF CALIBRATION**Certificate No. :** 66S0330-5**Job No. :** 66S0330**Page :** 1 of 2**Customer :** C.E.M Technology (Thailand) Co.,Ltd.**Address :** 31/9 Moo 13, Raikhing, Samphran,
Nakhornpathom 73210**Location :** Laboratory**Equipment :** Sound Level Meter**Ambient temperature :** (20 ± 2) °C**Manufacturer :** Tenmars**Relative humidity :** (50 ± 15) %**Model :** ST-109R**Atmospheric pressure :** -**Serial No. :** 221201934**Date of received :** 08-Mar-2023**Identity No. :** NS-11-001**Date of calibration :** 10-Mar-2023**Range :** See to Data**Date of issued :** 13-Mar-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	94.5	0.5	0.20
	104	104.5	0.5	0.20
	114	114.4	0.4	0.20
C	94	94.4	0.4	0.20
	104	104.4	0.4	0.20
	114	114.5	0.5	0.20
Z	94	94.4	0.4	0.20
	104	104.4	0.4	0.20
	114	114.5	0.5	0.20

UUC = Unit Under Calibration*

- The End -

CERTIFICATE OF CALIBRATION

Certificate No. : 66S0330-7

Job No. : 66S0330

Page : 1 of 2

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

Address : 31/9 Moo 13, Raikhing, Samphran,
Nakhornpathom 73210

Location : Laboratory

Equipment : Sound Level Meter

Manufacturer : Scarlet Tech

Model : ST-11D

Serial No. : 820388

Identity No. : NS-12-001

Range : See to Data

Ambient temperature : (20 ± 2) °C

Relative humidity : (50 ± 15) %

Atmospheric pressure : -

Date of received : 08-Mar-2023

Date of calibration : 10-Mar-2023

Date of issued : 13-Mar-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

[x] 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	94.3	0.3	0.20
	104	104.3	0.3	0.20
	114	114.2	0.2	0.20
B	94	94.0	0.0	0.20
	104	103.8	-0.2	0.20
	114	113.6	-0.4	0.20
Z	94	94.3	0.3	0.20
	104	103.8	-0.2	0.20
	114	113.6	-0.4	0.20

UUC = Unit Under Calibration*

- The End -

CERTIFICATE OF CALIBRATION

Certificate No. : 66S0330-6

Job No. : 66S0330

Page : 1 of 2

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

Address : 31/9 Moo 13, Raikhing, Samphran,

Nakhornpathom 73210

Location : Laboratory

Equipment : Sound Level Meter

Ambient temperature : (20 ± 2) °C

Manufacturer : Scarlet Tech

Relative humidity : (50 ± 15) %

Model : ST-11D

Atmospheric pressure : -

Serial No. : 820891

Date of received : 08-Mar-2023

Identity No. : NS-12-002

Date of calibration : 10-Mar-2023

Range : See to Data

Date of issued : 13-Mar-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	94.0	0.0	0.20
	104	104.0	0.0	0.20
	114	114.0	0.0	0.20
B	94	94.4	0.4	0.20
	104	104.0	0.0	0.20
	114	113.8	-0.2	0.20
Z	94	94.0	0.0	0.20
	104	104.0	0.0	0.20
	114	113.8	-0.2	0.20

UUC = Unit Under Calibration*

- The End -

CERTIFICATE OF CALIBRATION

Certificate No. : 66S0330-8

Job No. : 66S0330

Page : 1 of 2

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

Address : 31/9 Moo 13, Raikhing, Samphran,

Nakhornpathom 73210

Location : Laboratory

Equipment : Sound Level Meter

Ambient temperature : (20 ± 2) °C

Manufacturer : Scarlet Tech

Relative humidity : (50 ± 15) %

Model : ST-11D

Atmospheric pressure : -

Serial No. : 820892

Date of received : 08-Mar-2023

Identity No. : NS-12-003

Date of calibration : 10-Mar-2023

Range : See to Data

Date of issued : 13-Mar-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	94.1	0.1	0.20
	104	104.0	0.0	0.20
	114	114.0	0.0	0.20
B	94	93.8	-0.2	0.00
	104	103.7	-0.3	0.00
	114	113.7	-0.3	0.00
Z	94	93.9	-0.1	0.00
	104	103.9	-0.1	0.00
	114	113.9	-0.1	0.00

UUC = Unit Under Calibration*

- The End -

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi, Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30062

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226
SERIAL No. : 060209
ID No. : CEM-SI-01

SUBMITTED BY : C.E.M TECHNOLOGY (THAILAND) CO.,LTD.
219/43 MOO 12, PETCHKASEM RD., OMNOI,
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY : 
CALIBRATION DATE : 9-May-23

APPROVED BY : 
DHUDIT P.

ISSUED DATE : 9-May-23

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30062

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226 SERIAL NUMBER : 060209
ID No. : CEM-SI-01
RECEIVED DATE : 4-May-23 CALIBRATION DATE : 9-May-23
AMBIENT TEMPERATURE : $22^{\circ}\text{C} \pm 3^{\circ}\text{C}$ RELATIVE HUMIDITY : 50%RH \pm 20%RH

CONDITION OF THIS RESULTS OF CALIBRATION

- THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IEC 61672-2:2003-04 AGAINST MULTIFUNCTION SOUND CALIBRATOR.
THIS INSTRUMENT WAS PERFORMED SELF-CALIBRATION BY CALIBRATOR FROM CUSTOMER AT 114 Hz BEFORE CALIBRATION.
- REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No.	CERTIFICATTE No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR.	1986	01827	EEL.BP.55/0974	12-Jan-24

- THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
- THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
- THIS CERTIFICATE IS TRACEABLE TO :-
 - NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. A-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (\pm dB)
125.00	-16.10	-15.80	-0.30	0.50
250.00	-8.60	-8.10	-0.50	0.50
500.00	-3.20	-3.0	-0.20	0.50
1000.00	0.00	0.00	0.0	0.50
2000.00	1.20	0.90	0.3	0.50

2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (\pm dB)
125.00	-0.20	0.1	-0.3	0.50
250.00	0.00	0.5	-0.5	0.50
500.00	0.00	0.3	-0.3	0.50
1000.00	0.00	0.0	0.0	0.50
2000.00	-0.20	-0.4	0.2	0.50

3. SOUND LEVEL LINEARITY TEST AT 1000 Hz

STANDARD APPLIED (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (\pm dB)
74	74.0	0.0	0.50
84	84.0	0.0	0.50
94	94.0	0.0	0.50
104	104.1	-0.1	0.50
114	114.2	-0.2	0.50

UUC* : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR $k=2$, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%

END OF CALIBRATION REPORT

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi, Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30063

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226
SERIAL No. : 060210
ID No. : CEM-SI-03

SUBMITTED BY : C.E.M TECHNOLOGY (THAILAND) CO.,LTD.
219/43 MOO 12, PETCHKASEM RD., OMNOI,
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY : 
CALIBRATION DATE : 9-May-23

APPROVED BY : 
PHUDIT P.

ISSUED DATE : 9-May-23

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30063

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226 SERIAL NUMBER : 060210
ID No. : CEM-SI-03
RECEIVED DATE : 4-May-23 CALIBRATION DATE : 9-May-23
AMBIENT TEMPERATURE : 22 °C ± 3°C RELATIVE HUMIDITY : 50%RH ± 20%RH

CONDITION OF THIS RESULTS OF CALIBRATION

- THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IEC 61672-2:2003-04 AGAINST MULTIFUNCTION SOUND CALIBRATOR.
THIS INSTRUMENT WAS PERFORMED SELF-CALIBRATION BY CALIBRATOR FROM CUSTOMER AT 114 Hz BEFORE CALIBRATION.
- REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No.	CERTIFICATTE No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR.	1986	01827	EEL.BP.55/0974	12-Jan-24

- THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

- THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

- THIS CERTIFICATE IS TRACEABLE TO :-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. A-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-16.10	-15.80	-0.30	0.50
250.00	-8.60	-8.10	-0.50	0.50
500.00	-3.20	-3.0	-0.20	0.50
1000.00	0.00	0.00	0.0	0.50
2000.00	1.20	0.90	0.3	0.50

2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-0.20	0.1	-0.3	0.50
250.00	0.00	0.5	-0.5	0.50
500.00	0.00	0.3	-0.3	0.50
1000.00	0.00	0.0	0.0	0.50
2000.00	-0.20	-0.4	0.2	0.50

3. SOUND LEVEL LINEARITY TEST AT 1000 Hz

STANDARD APPLIED (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
74	74.0	0.0	0.50
84	84.0	0.0	0.50
94	94.0	0.0	0.50
104	104.1	-0.1	0.50
114	114.2	-0.2	0.50

UUC* : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%

END OF CALIBRATION REPORT

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi, Krathumban Samutsakorn 74130

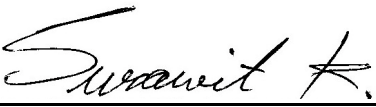
CERTIFICATE No : GR 17 E 30065

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226
SERIAL No. : 150005
ID No. : CEM-SI-05

SUBMITTED BY : C.E.M TECHNOLOGY (THAILAND) CO.,LTD.
219/43 MOO 12, PETCHKASEM RD., OMNOI,
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY : 
CALIBRATION DATE : 9-May-23

APPROVED BY : 
DHUDIT P.

ISSUED DATE : 9-May-23

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30065

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226 SERIAL NUMBER : 150005
ID No. : CEM-SI-05
RECEIVED DATE : 4-May-23 CALIBRATION DATE : 9-May-23
AMBIENT TEMPERATURE : 22 °C ± 3°C RELATIVE HUMIDITY : 50%RH ± 20%RH

CONDITION OF THIS RESULTS OF CALIBRATION

- THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IEC 61672-2:2003-04 AGAINST MULTIFUNCTION SOUND CALIBRATOR.
THIS INSTRUMENT WAS PERFORMED SELF-CALIBRATION BY CALIBRATOR FROM CUSTOMER AT 114 Hz BEFORE CALIBRATION.
- REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No.	CERTIFICATTE No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR.	1986	01827	EEL.BP.55/0974	12-Jan-24

- THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
- THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
- THIS CERTIFICATE IS TRACEABLE TO :-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH THAILAND INSTITUTE OF SCIENTIFIC AND
TECHNOLOGICAL RESEARCH (TISTR).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. A-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-16.10	-15.80	-0.30	0.50
250.00	-8.60	-8.10	-0.50	0.50
500.00	-3.20	-3.0	-0.20	0.50
1000.00	0.00	0.00	0.0	0.50
2000.00	1.20	0.90	0.3	0.50

2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-0.20	0.1	-0.3	0.50
250.00	0.00	0.5	-0.5	0.50
500.00	0.00	0.3	-0.3	0.50
1000.00	0.00	0.0	0.0	0.50
2000.00	-0.20	-0.4	0.2	0.50

3. SOUND LEVEL LINEARITY TEST AT 1000 Hz

STANDARD APPLIED (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
74	74.0	0.0	0.50
84	84.0	0.0	0.50
94	94.0	0.0	0.50
104	104.1	-0.1	0.50
114	114.2	-0.2	0.50

UUC* : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY
A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%

END OF CALIBRATION REPORT

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi, Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30066

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226
SERIAL No. : 150006
ID No. : CEM-SI-06

SUBMITTED BY : C.E.M TECHNOLOGY (THAILAND) CO.,LTD.
219/43 MOO 12, PETCHKASEM RD., OMNOI,
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY : 
SURAWIT K.

CALIBRATION DATE : 9-May-23

APPROVED BY : 
PHUDIT P.

ISSUED DATE : 9-May-23

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30066

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226 SERIAL NUMBER : 150006
ID No. : CEM-SI-06
RECEIVED DATE : 4-May-23 CALIBRATION DATE : 9-May-23
AMBIENT TEMPERATURE : 22 °C ± 3°C RELATIVE HUMIDITY : 50%RH ± 20%RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IEC 61672-2:2003-04 AGAINST MULTIFUNCTION SOUND CALIBRATOR. THIS INSTRUMENT WAS PERFORMED SELF-CALIBRATION BY CALIBRATOR FROM CUSTOMER AT 114 Hz BEFORE CALIBRATION.
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No.	CERTIFICATL No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR.	1986	01827	EEL.BP.55/0974	12-Jan-24

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO :-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. A-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-16.10	-15.80	-0.30	0.50
250.00	-8.60	-8.10	-0.50	0.50
500.00	-3.20	-3.0	-0.20	0.50
1000.00	0.00	0.00	0.0	0.50
2000.00	1.20	0.90	0.3	0.50

2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-0.20	0.1	-0.3	0.50
250.00	0.00	0.5	-0.5	0.50
500.00	0.00	0.3	-0.3	0.50
1000.00	0.00	0.0	0.0	0.50
2000.00	-0.20	-0.4	0.2	0.50

3. SOUND LEVEL LINEARITY TEST AT 1000 Hz

STANDARD APPLIED (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
74	74.0	0.0	0.50
84	84.0	0.0	0.50
94	94.0	0.0	0.50
104	104.1	-0.1	0.50
114	114.2	-0.2	0.50

UUC* : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%

END OF CALIBRATION REPORT

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi, Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30066

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226
SERIAL No. : 150006
ID No. : CEM-SI-06

SUBMITTED BY : C.E.M TECHNOLOGY (THAILAND) CO.,LTD.
219/43 MOO 12, PETCHKASEM RD., OMNOI,
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY : 
SURAWIT K.

CALIBRATION DATE : 16-May-22

APPROVED BY : 
PHUDIT P.

ISSUED DATE : 16-May-22

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30066

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226 SERIAL NUMBER : 150006
ID No. : CEM-SI-06
RECEIVED DATE : 13-May-22 CALIBRATION DATE : 16-May-22
AMBIENT TEMPERATURE : 22 °C ± 3°C RELATIVE HUMIDITY : 50%RH ± 20%RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IEC 61672-2:2003-04 AGAINST MULTIFUNCTION SOUND CALIBRATOR. THIS INSTRUMENT WAS PERFORMED SELF-CALIBRATION BY CALIBRATOR FROM CUSTOMER AT 114 Hz BEFORE CALIBRATION.
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No.	CERTIFICATTE No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR.	1986	01827	EEL.BP.55/0974	20-Jan-23

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.

4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.

5. THIS CERTIFICATE IS TRACEABLE TO :-

- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. A-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-16.10	-15.80	-0.30	0.50
250.00	-8.60	-8.10	-0.50	0.50
500.00	-3.20	-3.0	-0.20	0.50
1000.00	0.00	0.00	0.0	0.50
2000.00	1.20	0.90	0.3	0.50

2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-0.20	0.1	-0.3	0.50
250.00	0.00	0.5	-0.5	0.50
500.00	0.00	0.3	-0.3	0.50
1000.00	0.00	0.0	0.0	0.50
2000.00	-0.20	-0.4	0.2	0.50

3. SOUND LEVEL LINEARITY TEST AT 1000 Hz

STANDARD APPLIED (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
74	74.0	0.0	0.50
84	84.0	0.0	0.50
94	94.0	0.0	0.50
104	104.1	-0.1	0.50
114	114.2	-0.2	0.50

UUC* : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%

END OF CALIBRATION REPORT

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi, Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30067

PAGE : 1 OF 2


Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226
SERIAL No. : 150007
ID No. : CEM-SI-07

SUBMITTED BY : C.E.M TECHNOLOGY (THAILAND) CO.,LTD.
219/43 MOO 12, PETCHKASEM RD., OMNOI,
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY : 
SURAWIT K.

CALIBRATION DATE : 9-May-23

APPROVED BY : 
PHUDIT P.

ISSUED DATE : 9-May-23

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30067

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226 SERIAL NUMBER : 150007
ID No. : CEM-SI-07
RECEIVED DATE : 4-May-23 CALIBRATION DATE : 9-May-23
AMBIENT TEMPERATURE : 22 °C ± 3°C RELATIVE HUMIDITY : 50%RH ± 20%RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IEC 61672-2:2003-04 AGAINST MULTIFUNCTION SOUND CALIBRATOR. THIS INSTRUMENT WAS PERFORMED SELF-CALIBRATION BY CALIBRATOR FROM CUSTOMER AT 114 Hz BEFORE CALIBRATION.
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No.	CERTIFICATTE No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR.	1986	01827	EEL.BP.55/0974	12-Jan-24

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO :-
 - NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. A-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-16.10	-15.80	-0.30	0.50
250.00	-8.60	-8.10	-0.50	0.50
500.00	-3.20	-3.0	-0.20	0.50
1000.00	0.00	0.00	0.0	0.50
2000.00	1.20	0.90	0.3	0.50

2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-0.20	0.1	-0.3	0.50
250.00	0.00	0.5	-0.5	0.50
500.00	0.00	0.3	-0.3	0.50
1000.00	0.00	0.0	0.0	0.50
2000.00	-0.20	-0.4	0.2	0.50

3. SOUND LEVEL LINEARITY TEST AT 1000 Hz

STANDARD APPLIED (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
74	74.0	0.0	0.50
84	84.0	0.0	0.50
94	94.0	0.0	0.50
104	104.1	-0.1	0.50
114	114.2	-0.2	0.50

UUC* : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%

END OF CALIBRATION REPORT

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi, Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30068

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226
SERIAL No. : 150008
ID No. : CEM-SI-08

SUBMITTED BY : C.E.M TECHNOLOGY (THAILAND) CO.,LTD.
219/43 MOO 12, PETCHKASEM RD., OMNOI,
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY : 
SURAWIT K.

CALIBRATION DATE : 9-May-23

APPROVED BY : 
PHUDIT P.

ISSUED DATE : 9-May-23

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30068

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226 SERIAL NUMBER : 150008
ID No. : CEM-SI-08
RECEIVED DATE : 4-May-23 CALIBRATION DATE : 9-May-23
AMBIENT TEMPERATURE : 22 °C ± 3°C RELATIVE HUMIDITY : 50%RH ± 20%RH

CONDITION OF THIS RESULTS OF CALIBRATION

- THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IEC 61672-2:2003-04 AGAINST MULTIFUNCTION SOUND CALIBRATOR.
THIS INSTRUMENT WAS PERFORMED SELF-CALIBRATION BY CALIBRATOR FROM CUSTOMER AT 114 Hz BEFORE CALIBRATION.
- REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No.	CERTIFICATTE No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR.	1986	01827	EEL.BP.55/0974	12-Jan-24

- THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
- THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
- THIS CERTIFICATE IS TRACEABLE TO :-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH THAILAND INSTITUTE OF SCIENTIFIC AND
TECHNOLOGICAL RESEARCH (TISTR).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. A-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-16.10	-15.80	-0.30	0.50
250.00	-8.60	-8.10	-0.50	0.50
500.00	-3.20	-3.0	-0.20	0.50
1000.00	0.00	0.00	0.0	0.50
2000.00	1.20	0.90	0.3	0.50

2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-0.20	0.1	-0.3	0.50
250.00	0.00	0.5	-0.5	0.50
500.00	0.00	0.3	-0.3	0.50
1000.00	0.00	0.0	0.0	0.50
2000.00	-0.20	-0.4	0.2	0.50

3. SOUND LEVEL LINEARITY TEST AT 1000 Hz

STANDARD APPLIED (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
74	74.0	0.0	0.50
84	84.0	0.0	0.50
94	94.0	0.0	0.50
104	104.1	-0.1	0.50
114	114.2	-0.2	0.50

UUC* : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY
A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%

END OF CALIBRATION REPORT

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi, Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30069

PAGE : 1 OF 2

Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226
SERIAL No. : 150009
ID No. : CEM-SI-09

SUBMITTED BY : C.E.M TECHNOLOGY (THAILAND) CO.,LTD.
219/43 MOO 12, PETCHKASEM RD., OMNOI,
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY : 
SURAWIT K.

CALIBRATION DATE : 9-May-23

APPROVED BY : 
PHUDIT P.

ISSUED DATE : 9-May-23

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30069

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226 SERIAL NUMBER : 150009
ID No. : CEM-SI-09
RECEIVED DATE : 4-May-23 CALIBRATION DATE : 9-May-23
AMBIENT TEMPERATURE : 22 °C ± 3°C RELATIVE HUMIDITY : 50%RH ± 20%RH

CONDITION OF THIS RESULTS OF CALIBRATION

- THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IEC 61672-2:2003-04 AGAINST MULTIFUNCTION SOUND CALIBRATOR.
THIS INSTRUMENT WAS PERFORMED SELF-CALIBRATION BY CALIBRATOR FROM CUSTOMER AT 114 Hz BEFORE CALIBRATION.
- REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No.	CERTIFICATTE No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR.	1986	01827	EEL.BP.55/0974	12-Jan-24

- THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
- THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
- THIS CERTIFICATE IS TRACEABLE TO :-
- NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH THAILAND INSTITUTE OF SCIENTIFIC AND
TECHNOLOGICAL RESEARCH (TISTR).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. A-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-16.10	-15.80	-0.30	0.50
250.00	-8.60	-8.10	-0.50	0.50
500.00	-3.20	-3.0	-0.20	0.50
1000.00	0.00	0.00	0.0	0.50
2000.00	1.20	0.90	0.3	0.50

2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-0.20	0.1	-0.3	0.50
250.00	0.00	0.5	-0.5	0.50
500.00	0.00	0.3	-0.3	0.50
1000.00	0.00	0.0	0.0	0.50
2000.00	-0.20	-0.4	0.2	0.50

3. SOUND LEVEL LINEARITY TEST AT 1000 Hz

STANDARD APPLIED (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
74	74.0	0.0	0.50
84	84.0	0.0	0.50
94	94.0	0.0	0.50
104	104.1	-0.1	0.50
114	114.2	-0.2	0.50

UUC* : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY
A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%

END OF CALIBRATION REPORT

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi, Krathumban Samutsakorn 74130


CERTIFICATE No : GR 17 E 30070

PAGE : 1 OF 2


Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226
SERIAL No. : 150010
ID No. : CEM-SI-10

SUBMITTED BY : C.E.M TECHNOLOGY (THAILAND) CO.,LTD.
219/43 MOO 12, PETCHKASEM RD., OMNOI,
KRATHUMBAN SAMUTSAKORN 74130

CALIBRATED BY : 
SURAWIT K.

CALIBRATION DATE : 9-May-23

APPROVED BY : 
PHUDIT P.

ISSUED DATE : 9-May-23

G.Ruamkit Panich Co.,Ltd.

219/44 Moo 12 Petchkasem Rd., Omnoi,Krathumban Samutsakorn 74130

CERTIFICATE No : GR 17 E 30070

PAGE : 2 OF 2

Calibration Report

EQUIPMENT : SOUND LEVEL METER
MANUFACTURER : ACO
MODEL : TYPE 6226 SERIAL NUMBER : 150010
ID No. : CEM-SI-10
RECEIVED DATE : 4-May-23 CALIBRATION DATE : 9-May-23
AMBIENT TEMPERATURE : 22 °C ± 3°C RELATIVE HUMIDITY : 50%RH ± 20%RH

CONDITION OF THIS RESULTS OF CALIBRATION

1. THIS INSTRUMENT WAS CALIBRATED ACCORDING TO IEC 61672-2:2003-04 AGAINST MULTIFUNCTION SOUND CALIBRATOR. THIS INSTRUMENT WAS PERFORMED SELF-CALIBRATION BY CALIBRATOR FROM CUSTOMER AT 114 Hz BEFORE CALIBRATION.
2. REFERENCE STANDARD INSTRUMENTS :-

INSTRUMENT	MODEL	SERIAL No.	CERTIFICATTE No.	DUE DATE
1) MULTIFUNCTION SOUND CALIBRATOR.	1986	01827	EEL.BP.55/0974	12-Jan-24

3. THIS RESULT WAS FOUND ACCURATE AS SHOWN ON DATE AND PLACE OF CALIBRATION ONLY.
4. THIS RESULT EXCLUDE LONG TERM STABILITY OF THE UNIT UNDER CALIBRATION.
5. THIS CERTIFICATE IS TRACEABLE TO :-
 - NATIONAL INSTITUTE OF METROLOGY (THAILAND) THROUGH THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR).

RESULT OF CALIBRATION : WITHOUT ADJUSTMENT

1. A-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-16.10	-15.80	-0.30	0.50
250.00	-8.60	-8.10	-0.50	0.50
500.00	-3.20	-3.0	-0.20	0.50
1000.00	0.00	0.00	0.0	0.50
2000.00	1.20	0.90	0.3	0.50

2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE

FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-0.20	0.1	-0.3	0.50
250.00	0.00	0.5	-0.5	0.50
500.00	0.00	0.3	-0.3	0.50
1000.00	0.00	0.0	0.0	0.50
2000.00	-0.20	-0.4	0.2	0.50

3. SOUND LEVEL LINEARITY TEST AT 1000 Hz

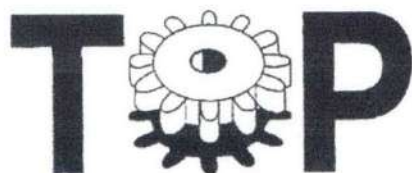
STANDARD APPLIED (dB)	UUC READING (dB)	CORRECTION (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
74	74.0	0.0	0.50
84	84.0	0.0	0.50
94	94.0	0.0	0.50
104	104.1	-0.1	0.50
114	114.2	-0.2	0.50

UUC* : UNIT UNDER CALIBRATION

THE REPORTED UNCERTAINTY OF MEASUREMENT WAS BASED ON A STANDARD UNCERTAINTY MULTIPLIED BY A COVERAGE FACTOR k=2, PROVIDING A LEVEL OF CONFIDENCE APPROXIMATELY 95%

END OF CALIBRATION REPORT

เอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพอากาศในบรรยากาศ



Trade & Engineering

TSP High Volume Sampler TE-5000 TSP Sampler Verification

Site Information

Location: -	Site ID: -	Date: 9 Jan 23
Sampler: TE-5000 TSP	Serial No: 3265	Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 28.00	Corrected Pressure (mm Hg): 711.2
Temperature (deg F): 76.0	Temperature (deg K): 297.6
Average Press. (in Hg): 27.00	Corrected Average (mm Hg): 685.8
Average Temp (Deg F): 75.1	Average Temp: (Deg K): 297.1

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	9.80	1.924	65.1	63.02	Slope: 43.1008
2	8.00	1.739	58.4	56.53	Intercept: -19.2099
3	6.60	1.581	51.2	49.56	Corr. Coeff: 0.9957
4	6.10	1.520	48.0	46.47	
5	5.50	1.444	43.5	42.11	

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

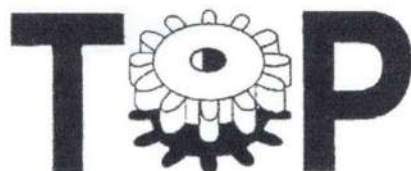
I = chart response

Tav = daily average temperature

Pav = daily average pressure

nter Average I (chart):	44.0
Average Flow Calculation m3/min	1.416920496
Average Flow Calculation in cfm	50.03250272
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	2040.365514
Total flow in 24 hours cfm	72046.80391

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: 9 Jan 23
Sampler: TE-5000 TSP	Serial No: 3266	Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 28.00	Corrected Pressure (mm Hg): 711.2
Temperature (deg F): 76.0	Temperature (deg K): 297.6
Average Press. (in Hg): 27.00	Corrected Average (mm Hg): 685.8
Average Temp (Deg F): 75.3	Average Temp: (Deg K): 297.2

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	8.20	1.761	63.6	61.57	Slope: 38.1692
2	6.40	1.557	56.9	55.08	Intercept: -5.0169
3	5.00	1.377	49.7	48.11	Corr. Coeff: 0.9967
4	4.50	1.307	46.5	45.01	
5	3.90	1.217	42.0	40.66	
					# of Observations: 5

Calculations

$Q_{std} = 1/m[\text{Sqrt}(H_2O(P_a/P_{std})(T_{std}/T_a)) - b]$
 $IC = I[\text{Sqrt}(P_a/P_{std})(T_{std}/T_a)]$

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:

$1/m((I[\text{Sqrt}(298/T_{av})(P_{av}/760)] - b)$

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

enter Average I (chart):	44.0
Average Flow Calculation m3/min	1.22794512
Average Flow Calculation in cfm	43.35964351
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	1768.240973
Total flow in 24 hours cfm	62437.88665

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: 9 Jan 23
Sampler: TE-5000 TSP	Serial No: 3268	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): 27.00	Corrected Average (mm Hg): 685.8
Average Temp (Deg F): 75.2	Average Temp: (Deg K): 297.2

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	7.30	1.650	62.7	60.26	Slope: 35.0463
2	5.50	1.433	56.0	53.82	Intercept: 2.9864
3	4.10	1.239	48.8	46.90	Corr. Coeff: 0.9975
4	3.60	1.162	45.6	43.83	
5	3.00	1.061	41.1	39.50	

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):	49.0
Average Flow Calculation m3/min	1.244829703
Average Flow Calculation in cfm	43.95585051
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	1792.554772
Total flow in 24 hours cfm	63296.42474

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: 17 Oct 22
Sampler: TE-5000 TSP	Serial No: 3269	Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 29.20	Corrected Pressure (mm Hg): 760.6
Temperature (deg F): 77.1	Temperature (deg K): 298.2
Average Press. (in Hg): 29.80	Corrected Average (mm Hg): 760.5
Average Temp (Deg F): 77.9	Average Temp: (Deg K): 298.7

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	7.60	1.751	53.0	53.00	Slope: 28.3923
2	5.70	1.518	48.0	48.00	Intercept: 4.0489
3	4.50	1.350	43.0	43.00	Corr. Coeff: 0.9959
4	3.40	1.174	37.0	37.00	
5	2.80	1.067	34.0	34.00	

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

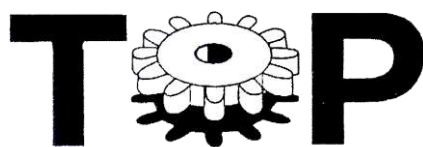
I = chart response

Tav = daily average temperature

Pav = daily average pressure

Enter Average I (chart):	38.0
Average Flow Calculation m3/min	1.194766279
Average Flow Calculation in cfm	42.18807427
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	1720.463442
Total flow in 24 hours cfm	60750.82695

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: 1.58304
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

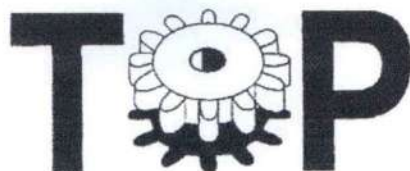
I = chart response

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

TSP High Volume Sampler TE-5000 TSP Sampler Verification

Site Information

Location: -	Site ID: -	Date: 17 Oct 22
Sampler: TE-5000 TSP	Serial No: 3270	Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 29.30	Corrected Pressure (mm Hg): 758.6
Temperature (deg F): 76.4	Temperature (deg K): 297.8
Average Press. (in Hg): 29.90	Corrected Average (mm Hg): 760.1
Average Temp (Deg F): 76.0	Average Temp (Deg K): 297.6

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	7.70	1.761	54.0	53.97	Slope: 28.6924
2	5.80	1.530	49.0	48.97	Intercept: 4.2033
3	4.60	1.364	44.0	43.97	Corr. Coeff: 0.9958
4	3.50	1.191	38.0	37.98	
5	2.90	1.085	35.0	34.98	

of Observations: 5

Calculations

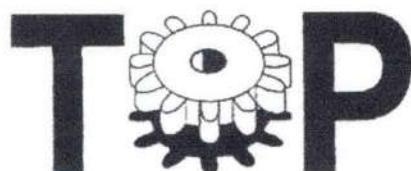
$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta)) - b]$
 $IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$

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

nter Average I (chart):	40.3
Average Flow Calculation m3/min	1.259109112
Average Flow Calculation in cfm	44.46006692
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	1813.117121
Total flow in 24 hours cfm	64022.49637

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: 17 Oct 22
Sampler: TE-5000 TSP	Serial No: 3271	Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 28.60	Corrected Pressure (mm Hg): 758.6
Temperature (deg F): 75.7	Temperature (deg K): 297.4
Average Press. (in Hg): 28.40	Corrected Average (mm Hg): 760.1
Average Temp (Deg F): 76.2	Average Temp (Deg K): 297.7

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	7.70	1.763	55.0	55.00	Slope: 28.9848
2	5.90	1.544	49.0	49.00	Intercept: 4.1522
3	4.80	1.394	45.0	45.00	Corr. Coeff: 0.9993
4	3.60	1.208	39.0	39.00	
5	3.00	1.104	36.0	36.00	

of Observations: 5

Calculations

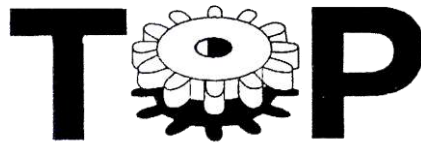
$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta)) - b]$
 $IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$

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

nter Average I (chart):	40.6
Average Flow Calculation m3/min	1.258264079
Average Flow Calculation in cfm	44.4302282
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	1811.900274
Total flow in 24 hours cfm	63979.5286

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: 3272	Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 27.00	Corrected Pressure (mm Hg): 685.8
Temperature (deg F): 76.0	Temperature (deg K): 297.6
Average Press. (in Hg): 27.00	Corrected Average (mm Hg): 685.8
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	6.80	1.575	62.1	59.03	Slope: 39.9337
2	5.50	1.418	58.4	55.51	Intercept: -2.7031
3	4.40	1.269	50.6	48.10	Corr. Coeff: 0.9857
4	4.00	1.211	48.7	46.29	
5	3.50	1.133	43.5	41.35	
					# 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

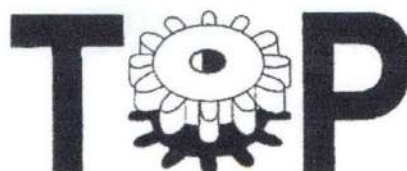
I = chart response

Tav = daily average temperature

Pav = daily average pressure

Enter Average I (chart):	52.7
Average Flow Calculation m3/min	1.322373774
Average Flow Calculation in cfm	46.69398859
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	1904.218235
Total flow in 24 hours cfm	67239.34358

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: 18 Oct 22
Sampler: TE-5000 TSP	Serial No: 3274	Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 29.00	Corrected Pressure (mm Hg): 760.1
Temperature (deg F): 78.0	Temperature (deg K): 298.7
Average Press. (in Hg): 31.00	Corrected Average (mm Hg): 761.2
Average Temp (Deg F): 77.5	Average Temp (Deg K): 298.4

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	8.00	1.794	58.0	57.94	Slope: 29.8242
2	6.20	1.581	52.0	51.94	Intercept: 4.6274
3	4.80	1.392	46.5	46.45	Corr. Coeff: 0.9996
4	3.90	1.256	42.0	41.95	
5	3.30	1.156	39.0	38.96	

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

nter Average I (chart):	40.3
Average Flow Calculation m3/min	1.196192875
Average Flow Calculation in cfm	42.23844844
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	1722.517741
Total flow in 24 hours cfm	60823.36575

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: 18 Oct 22
Sampler: TE-5000 TSP	Serial No: 3277	Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 30.00	Corrected Pressure (mm Hg): 762.0
Temperature (deg F): 77.0	Temperature (deg K): 298.2
Average Press. (in Hg): 30.00	Corrected Average (mm Hg): 762.0
Average Temp (Deg F): 78.4	Average Temp: (Deg K): 298.9

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	7.70	1.764	54.0	54.06	Slope: 28.8279
2	5.70	1.519	49.0	49.05	Intercept: 4.0986
3	4.60	1.366	44.0	44.05	Corr. Coeff: 0.9942
4	3.50	1.193	38.0	38.04	
5	2.90	1.086	35.0	35.04	

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

nter Average I (chart):	40.1
Average Flow Calculation m3/min	
1.248502955	
Average Flow Calculation in cfm	
44.08555575	
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	
1797.844256	
Total flow in 24 hours cfm	
63483.20029	

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: 18 Oct 22
Sampler: TE-5000 TSP	Serial No: 3278	Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 30.00	Corrected Pressure (mm Hg): 762.0
Temperature (deg F): 77.0	Temperature (deg K): 298.2
Average Press. (in Hg): 29.00	Corrected Average (mm Hg): 736.6
Average Temp (Deg F): 76.0	Average Temp: (Deg K): 297.6

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	8.00	1.798	59.0	59.06	Slope: 31.2168
2	6.20	1.584	54.0	54.06	Intercept: 3.7240
3	4.80	1.395	48.0	48.05	Corr. Coeff: 0.9929
4	4.30	1.321	45.0	45.05	
5	3.70	1.226	41.0	41.04	

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):	43.0
Average Flow Calculation m3/min	1.237719032
Average Flow Calculation in cfm	43.70476751
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	1782.315406
Total flow in 24 hours cfm	62934.86521

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: -
Sampler: TE-5000 TSP

Site ID: -
Serial No: 3280

Date: 19 Oct 22
Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 30.00	Corrected Pressure (mm Hg): 762.0
Temperature (deg F): 77.0	Temperature (deg K): 298.2
Average Press. (in Hg): 29.00	Corrected Average (mm Hg): 736.6
Average Temp (Deg F): 76.5	Average Temp: (Deg K): 297.9

Calibration Orifice

Make: Tisch
Model: TE-5028A
Serial#: 1179

Qstd Slope: 1.58304
Qstd Intercept: -0.01520
Calibration Due Date 12 December 2023

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	Linear Regression
1	8.20	1.820	64.0	64.07	Slope: 37.2576
2	6.40	1.609	57.0	57.06	Intercept: -3.3546
3	5.00	1.424	50.0	50.05	Corr. Coeff: 0.9987
4	4.50	1.351	47.0	47.05	
5	3.90	1.258	43.0	43.05	
					# 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

nter Average I (chart):	45.6
Average Flow Calculation m3/min	1.295216625
Average Flow Calculation in cfm	45.7350497
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	1865.111939
Total flow in 24 hours cfm	65858.47157

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: 19 Oct 22
Sampler: TE-5000 TSP	Serial No: 3281	Tech: Tong.P

Site Conditions

Barometric Pressure (in Hg): 31.00	Corrected Pressure (mm Hg): 787.4
Temperature (deg F): 76.0	Temperature (deg K): 297.6
Average Press. (in Hg): 28.00	Corrected Average (mm Hg): 711.2
Average Temp (Deg F): 75.9	Average Temp: (Deg K): 297.5

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	8.30	1.863	63.0	64.17	Slope: 37.5798
2	6.50	1.650	56.0	57.04	Intercept: -5.4367
3	5.10	1.463	49.0	49.91	Corr. Coeff: 0.9986
4	4.60	1.390	46.0	46.85	
5	4.00	1.296	42.0	42.78	

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

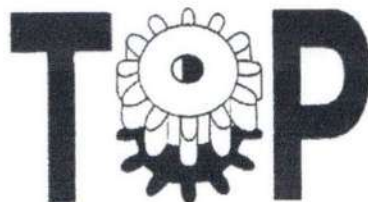
I = chart response

Tav = daily average temperature

Pav = daily average pressure

nter Average I (chart):	43.0
Average Flow Calculation m3/min	1.252415345
Average Flow Calculation in cfm	44.2237051
Sample Time (Hrs):	24.0
Total flow in 24 hours m3/min	1803.478097
Total flow in 24 hours cfm	63682.13534

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

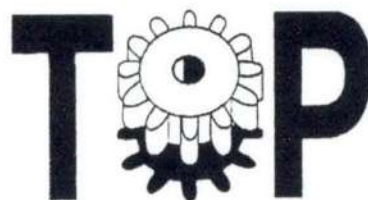
Total flow over sample (m3/min)

1482.262184

Total flow over sample (CFM)

52338.6777

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



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

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

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:

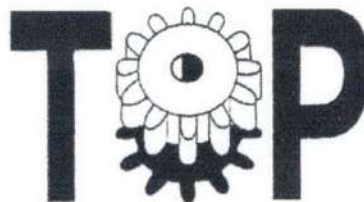
$$SFR = 1.13(Ps/Pa)(Ta/Ts)$$
$$SSP = (m*SFR+b)(\text{Sqrt}(Pa/Ta))$$

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): 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



Trade & Engineering

PM10 High Volume Sampler Verification

Site Information

Location: -

Site ID: -

Date: 4 October 2022

Sampler: TE-6070 PM10

Serial No: 3115

Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 29.00

Temperature (deg F): 77.0

Average Press. (in Hg): 28.00

Average Temp. (deg F): 77.6

Corrected Pressure (mm Hg): 760.1

Temperature (deg K): 298.0

Corrected Average (mm Hg): 760.8

Average Temp. (deg K): 298.3

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	6.90	1.049	58.0	36.32	Slope 27.3102
2	5.10	0.903	53.0	33.19	Intercept 8.0654
3	3.90	0.791	48.0	30.05	Corr. Coeff 0.9967
4	3.10	0.706	43.0	26.92	SFR 1.130
5	1.90	0.555	37.0	23.17	SSP 62.16

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

Average I(chart): 56.9

Average Flow over Sample (m3/min)

1.009352883

Enter Total Time (Hrs): 24.0

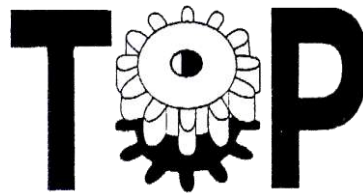
Total flow over sample (m3/min)

1453.468152

Total flow over sample (CFM)

51321.96044

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

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

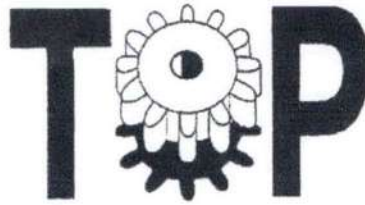
Qa = actual flow rate
IC = corrected chart response
m = calibrator slope
b = calibrator intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
For subsequent calculation
of sampler flow:

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



Trade & Engineering

PM10 High Volume Sampler Verification

Site Information

Location: -

Site ID: -

Date: 4 October 2022

Sampler: TE-6070 PM10 Serial No: 3183

Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 29.52

Temperature (deg F): 77.1

Average Press. (in Hg): 29.94

Average Temp. (deg F): 76.8

Corrected Pressure (mm Hg): 760.1

Temperature (deg K): 298.1

Corrected Average (mm Hg): 761.2

Average Temp. (deg K): 297.9

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	5.00	0.894	43.0	26.93	Slope 29.1674
2	4.10	0.811	40.0	25.05	Intercept 1.2156
3	3.70	0.770	38.2	23.92	Corr. Coeff 0.9972
4	3.00	0.695	34.6	21.67	SFR 1.132
5	1.90	0.555	27.4	17.16	SSP 54.68

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)

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

Average I(chart): 50.0

Average Flow over Sample (m3/min)

1.030708331

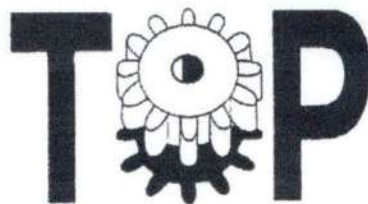
Enter Total Time (Hrs): 24.0

Total flow over sample (m3/min)

1484.219996

Total flow over sample (CFM)

52407.80807



Trade & Engineering

PM10 High Volume Sampler Verification

Site Information

Location: -

Site ID: -

Date: 4 October 2022

Sampler: TE-6070 PM10 Serial No: 3211

Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 26.54

Temperature (deg F): 77.9

Average Press. (in Hg): 29.45

Average Temp. (deg F): 77.0

Corrected Pressure (mm Hg): 760.4

Temperature (deg K): 298.5

Corrected Average (mm Hg): 759.8

Average Temp. (deg K): 298.0

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	7.30	1.079	55.0	34.46	Slope 30.9235
2	5.50	0.938	50.0	31.33	Intercept 1.6630
3	4.30	0.830	44.0	27.57	Corr. Coeff 0.9941
4	3.70	0.771	41.0	25.69	SFR 1.131
5	2.80	0.672	35.0	21.93	SSP 58.48

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

Average I(chart): 55.1

Average Flow over Sample (m3/min)

1.062113613

Enter Total Time (Hrs): 24.0

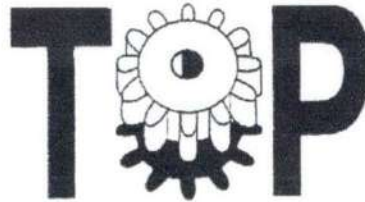
Total flow over sample (m3/min)

1529.443603

Total flow over sample (CFM)

54004.65361

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: 4 October 2022

Sampler: TE-6070 PM10

Serial No: 3245

Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 29.47

Temperature (deg F): 76.9

Average Press. (in Hg): 28.70

Average Temp. (deg F): 77.0

Corrected Pressure (mm Hg): 759.0

Temperature (deg K): 297.9

Corrected Average (mm Hg): 760.2

Average Temp. (deg K): 298.0

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	7.40	1.086	56.0	35.09	Slope 32.3113
2	5.60	0.946	50.0	31.33	Intercept 0.4536
3	4.40	0.840	45.0	28.19	Corr. Coeff 0.9961
4	3.60	0.761	40.0	25.06	SFR 1.132
5	2.70	0.660	34.0	21.30	SSP 59.08

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

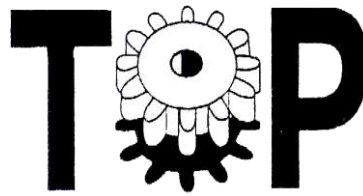
I = chart response

Tav = daily average temperature

Pav = daily average pressure

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

Average I(chart):	55.6
Average Flow over Sample (m3/min)	1.063332321
Enter Total Time (Hrs):	24.0
Total flow over sample (m3/min)	1531.198543
Total flow over sample (CFM)	54066.62055



Trade & Engineering

PM10 High Volume Sampler Verification

Site Information

Location: - Site ID: - Date: 2 October 2023
Sampler: TE-6070 PM10 Serial No: 3310 Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 26.70 Corrected Pressure (mm Hg): 678.2
Temperature (deg F): 75.1 Temperature (deg K): 296.9
Average Press. (in Hg): 26.50 Corrected Average (mm Hg): 673.1
Average Temp. (deg F): 76.2 Average Temp. (deg K): 297.6

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	9.80	1.318	60.7	40.17	Slope 34.0987
2	7.40	1.147	55.6	36.79	Intercept -3.7000
3	6.60	1.083	50.8	33.61	Corr. Coeff 0.9779
4	5.35	0.976	45.7	30.24	SFR 1.119
5	4.60	0.906	39.1	25.87	SSP 52.08

of Observations: 5

Calculations

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

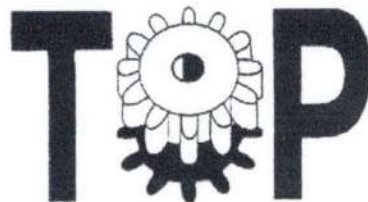
Qa = actual flow rate
IC = corrected chart response
m = calibrator slope
b = calibrator intercept
Ta = actual temperature (deg K)
Pa = actual pressure (mm Hg)
For subsequent calculation
of sampler flow:

$SFR = 1.13(Ps/Pa)(Ta/Ts)$
 $SSP = (m*SFR+b)(\text{Sqrt}(Pa/Ta))$
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): 50.4
Average Flow over Sample (m3/min)
1.091243428
Enter Total Time (Hrs): 24.0
Total flow over sample (m3/min)
1571.390536
Total flow over sample (CFM)
55485.79984



Trade & Engineering

PM10 High Volume Sampler Verification

Site Information

Location: -

Site ID: -

Date: 4 October 2022

Sampler: TE-6070 PM10 Serial No: 3310

Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 29.47

Temperature (deg F): 77.0

Average Press. (in Hg): 28.70

Average Temp. (deg F): 77.1

Corrected Pressure (mm Hg): 760.1

Temperature (deg K): 298.0

Corrected Average (mm Hg): 761.3

Average Temp. (deg K): 298.1

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	7.60	1.100	57.0	35.69	Slope 32.3375
2	5.80	0.962	51.0	31.93	Intercept 0.5255
3	4.60	0.858	46.0	28.80	Corr. Coeff 0.9972
4	3.80	0.781	41.0	25.67	SFR 1.132
5	2.80	0.671	35.0	21.91	SSP 59.28

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): 55.6

Average Flow over Sample (m3/min)

1.059570151

Enter Total Time (Hrs): 24.0

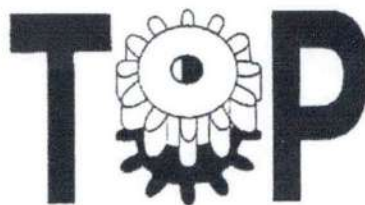
Total flow over sample (m3/min)

1525.781017

Total flow over sample (CFM)

53875.32771

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: 4 October 2022

Sampler: TE-6070 PM10 Serial No: 3524

Tech: Tong P.

Site Conditions

Barometric Pressure (in Hg): 27.45

Temperature (deg F): 77.5

Average Press. (in Hg): 29.20

Average Temp. (deg F): 77.6

Corrected Pressure (mm Hg): 760.1

Temperature (deg K): 298.3

Corrected Average (mm Hg): 760.0

Average Temp. (deg K): 298.3

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	7.90	1.122	59.0	36.96	Slope 30.7009
2	6.10	0.987	54.0	33.83	Intercept 3.0086
3	4.90	0.886	49.0	30.70	Corr. Coeff 0.9957
4	4.10	0.811	44.0	27.56	SFR 1.130
5	2.90	0.683	38.0	23.80	SSP 60.17

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

Average I(chart): 55.7

Average Flow over Sample (m3/min)

1.038708375

Enter Total Time (Hrs): 24.0

Total flow over sample (m3/min)

1495.740061

Total flow over sample (CFM)

52814.58154

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

Certificate of Analyzer Performance Testing

Calibrated Date : 4-Aug-22

Certificate No. : 0822-001

Page : 1/1

Analyzer Instruments

Analyzer Type : CO Analyzer

Manufacturer : Thermo Environmental

Model : 48C

Serial No. : 508011061

Environmental

Temperature : 25.7 °C

Humidity : 54.1 %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

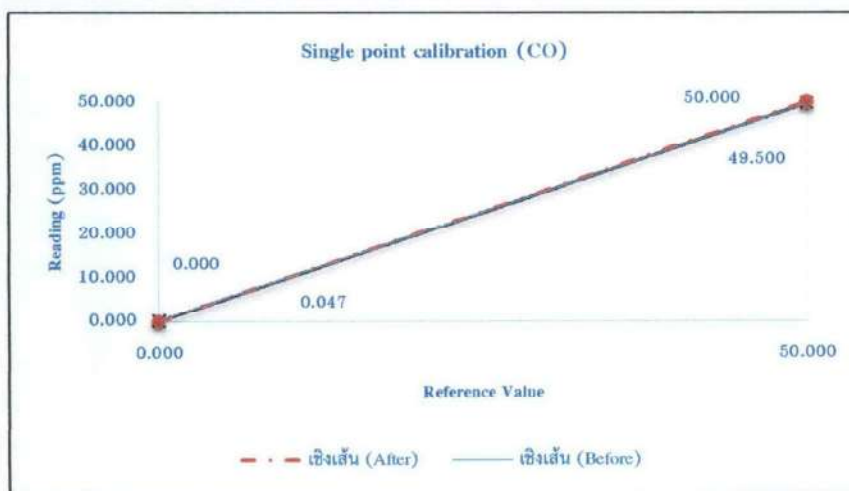
SO2 Conc. : 2 ppm

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						
CO	0.047	0.000	0.05	49.5	50.000	-1.00
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



Calibrated by :


 (Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 22-Jul-23

Certificate No. : 0723-001

Page : 1/1

Analyzer Instruments

Analyzer Type : CO Analyzer

Manufacturer : Thermo Environmental

Model : 48C

Serial No. : 508011061

Environmental

Temperature : 24.2 °C

Humidity : 52.0 %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

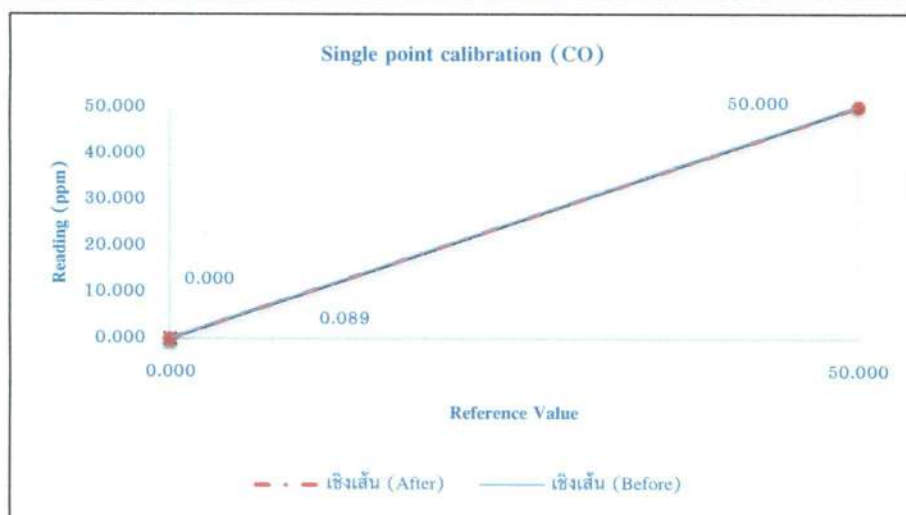
SO2 Conc. : 2 ppm

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						
CO	0.089	0.000	0.09	50.2	50.000	0.40
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



Calibrated by :


 (Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 1-Sep-22

Certificate No. : 0922-005

Page : 1/1

Analyzer Instruments

Analyzer Type : CO Analyzer

Manufacturer : Thermo Environmental

Model : 48C

Serial No. : 508011064

Environmental

Temperature : 26.7 °C

Humidity : 56.9 %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

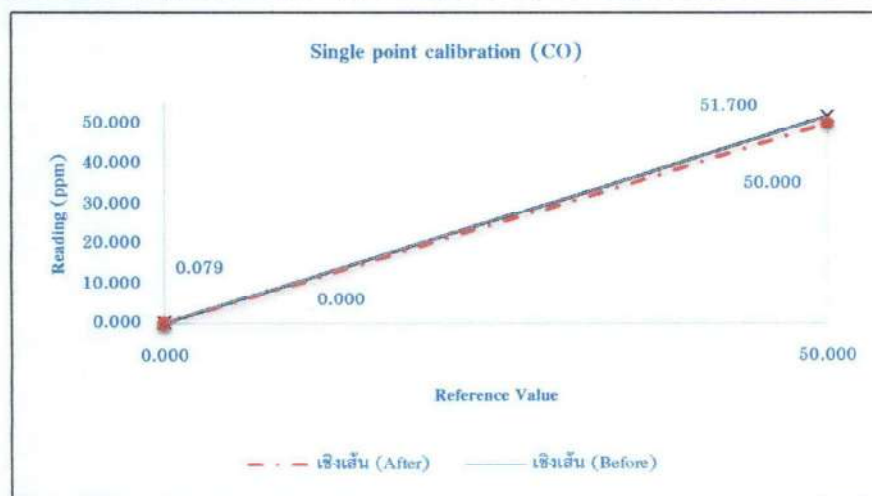
SO2 Conc. : 2 ppm

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						
CO	0.079	0.000	0.08	51.7	50.000	3.40
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



Calibrated by :


(Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 26-Aug-23

Certificate No. : 0823-006

Page : 1/1

Analyzer Instruments

Analyzer Type : CO Analyzer

Manufacturer : Thermo Environmental

Model : 48C

Serial No. : 508011064

Environmental

Temperature : 24.9 °C

Humidity : 41.3 %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

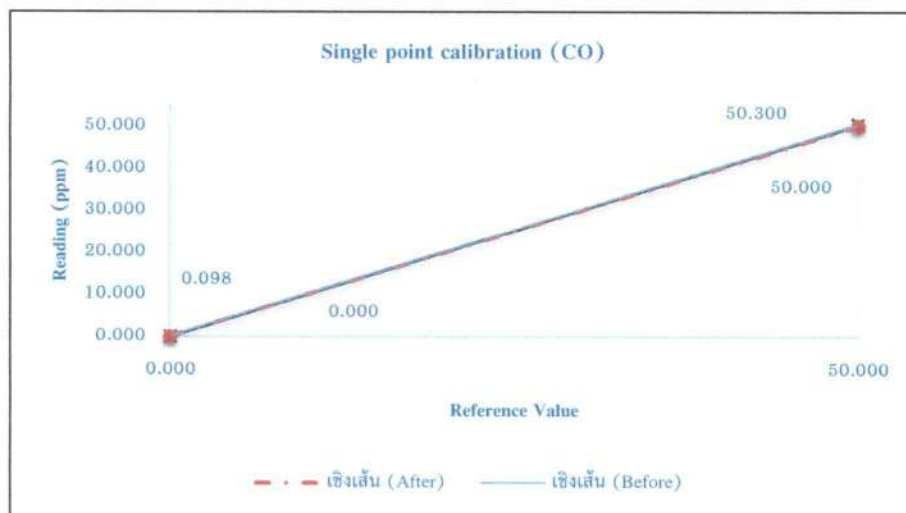
SO2 Conc. : 2 ppm

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						
CO	0.098	0.000	0.10	50.3	50.000	0.60
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



Calibrated by :


(Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 15-Jun-22

Certificate No. : 0622-001

Page : 1/1

Analyzer Instruments

Analyzer Type : CO Analyzer

Manufacturer : Thermo Environmental

Model : 48C

Serial No. : 508011068

Environmental

Temperature : 24.1 °C

Humidity : 52.1 %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

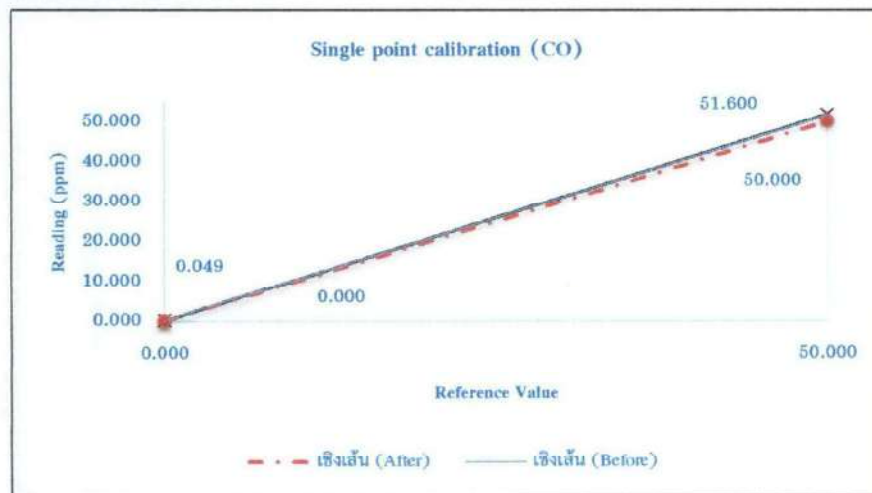
SO₂ Conc. : 2 ppm

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						
CO	0.049	0.000	0.05	51.6	50.000	3.20
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



Calibrated by :


 (Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 10-Jun-23

Certificate No. : 0623-001

Page : 1/1

Analyzer Instruments

Analyzer Type : CO Analyzer

Manufacturer : Thermo Environmental

Model : 48C

Serial No. : 508011068

Environmental

Temperature : 25.2 °C

Humidity : 51.3 %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

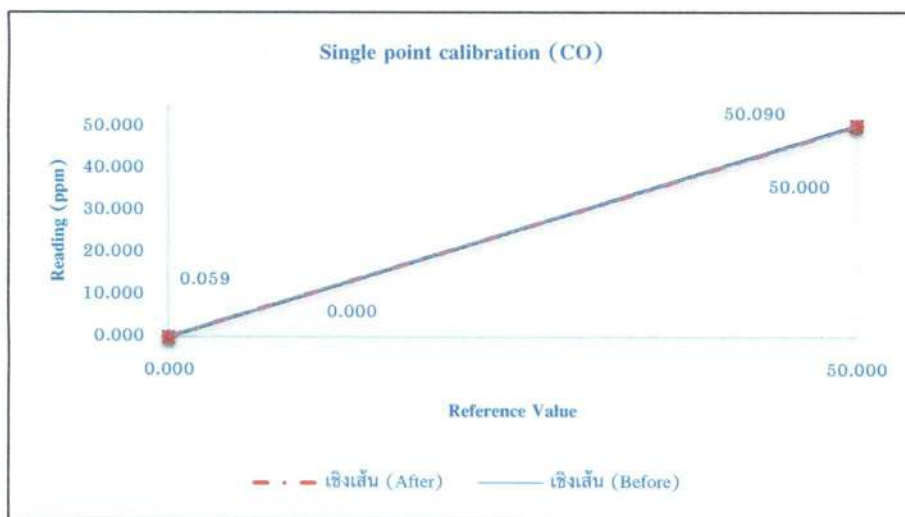
SO2 Conc. : 2 ppm

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						
CO	0.059	0.000	0.06	50.1	50.000	0.18
After						
CO	0.000	0.000	0.00	50.0	50.000	0.00



Calibrated by :


 (Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 21-Jan-23

Certificate No. : 0123-003

Page : 1/1

Analyzer Instruments

Analyzer Type : CO Analyzer

Manufacturer : Thermo Environmental

Model : 48C

Serial No. : 71021-367

Environmental

Temperature : 26.4 °C

Humidity : 52.7 %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

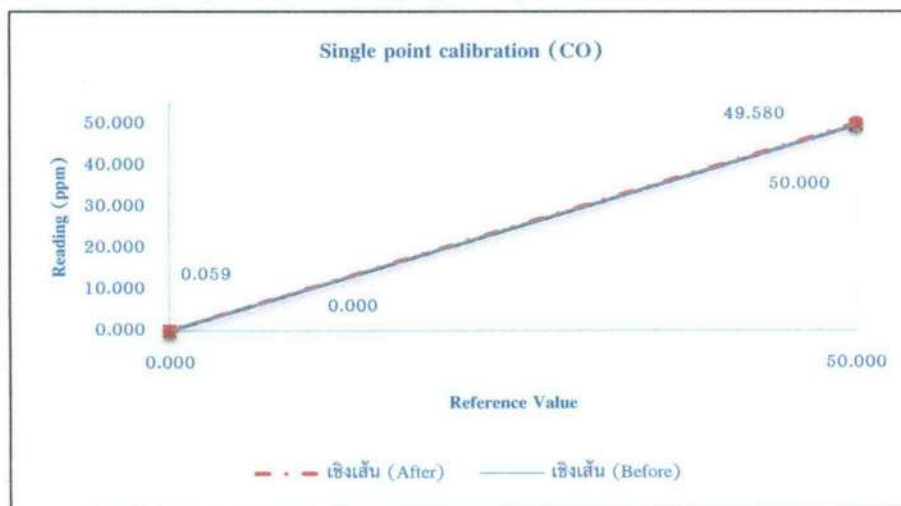
SO2 Conc. : 2 ppm

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						
CO	0.059	0.000	0.06	49.580	50.000	-0.84
After						
CO	0.000	0.000	0.00	50.000	50.000	0.00



Calibrated by :


 (Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 4-Feb-23

Certificate No. : 0223-001

Page : 1/1

Analyzer Instruments

Analyzer Type : CO Analyzer

Manufacturer : Thermo Environmental

Model : 48i

Serial No. : 1172750062

Environmental

Temperature : 24.7 °C

Humidity : 52.8 %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

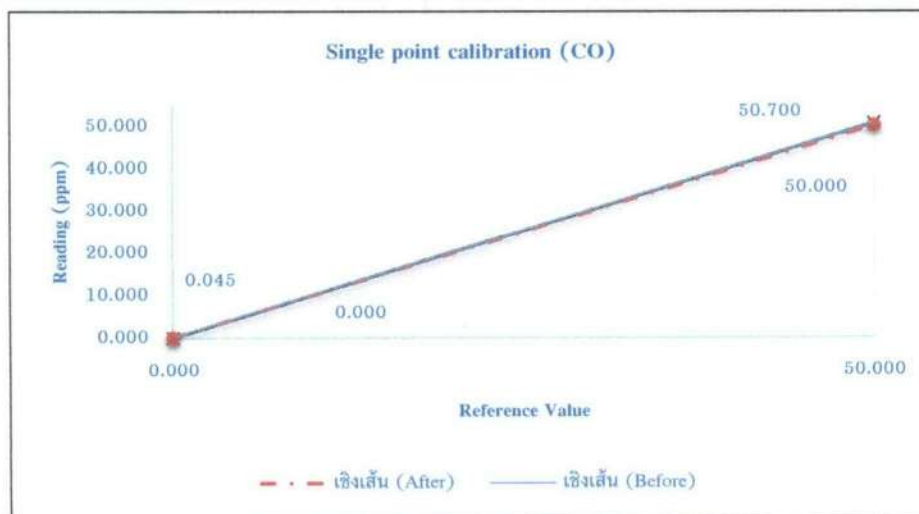
SO₂ Conc. : 2 ppm

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						
CO	0.045	0.000	0.05	50.7	50.0	1.40
After						
CO	0.000	0.000	0.00	50.0	50.0	0.00



Calibrated by :


(Mr. Tong Piima)

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

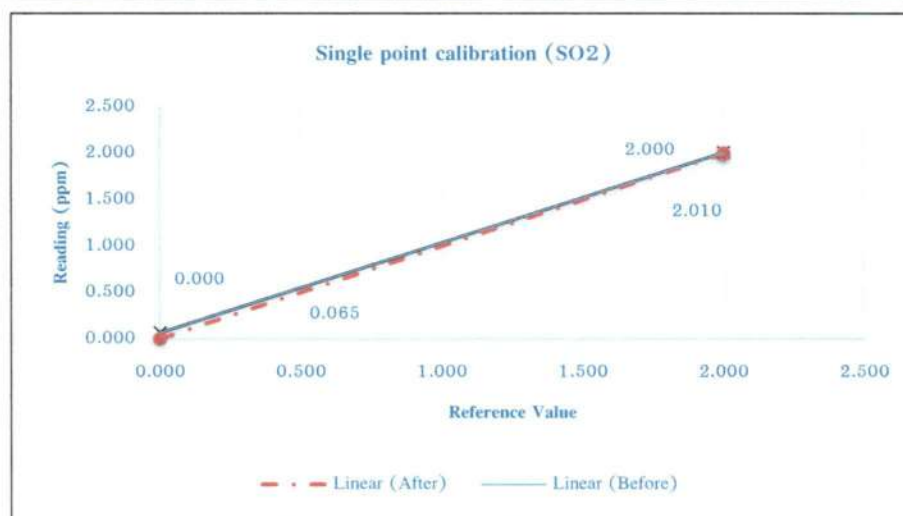
SO2 Conc. : 2 ppm

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 : 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

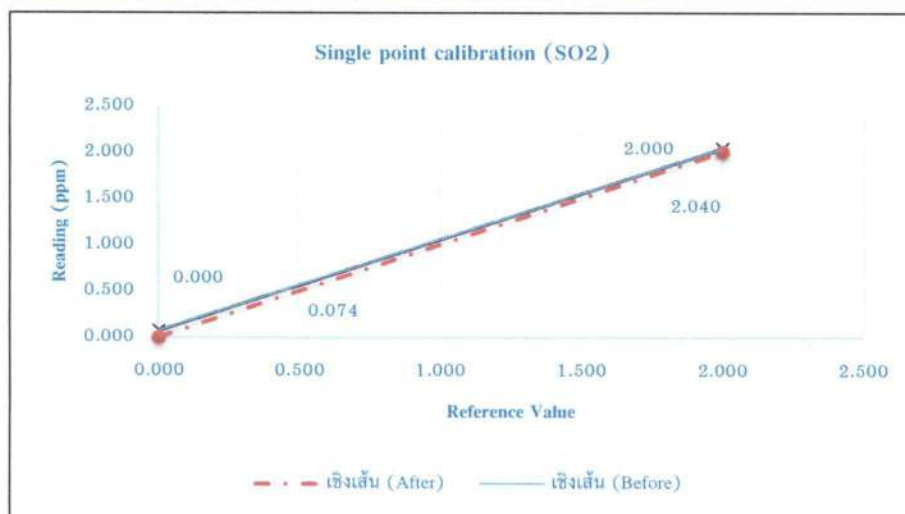
SO2 Conc. : 2 ppm

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 : 1-Apr-23

Certificate No. : 0423-003

Page : 1/1

Analyzer Instruments

Analyzer Type : SO2 Analyzer

Manufacturer : Thermo Environmental

Model : 43C

Serial No. : 69858-364

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

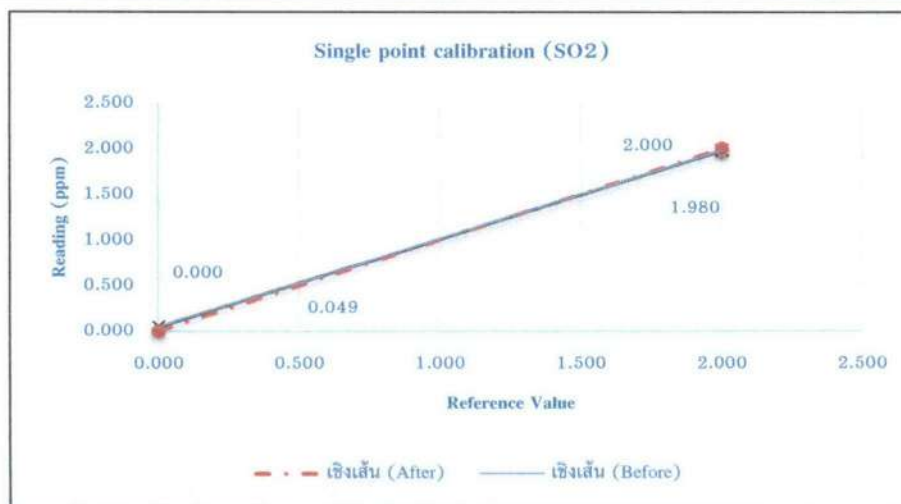
SO2 Conc. : 2 ppm

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	0.049	0.000	0.05	1.98	2.000	-1.00
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 : 10-Aug-22

Certificate No. : 0822-004

Page : 1/1

Analyzer Instruments

Analyzer Type : SO2 Analyzer

Manufacturer : Thermo Environmental

Model : 43C

Serial No. : 62201-334

Environmental

Temperature : 24.3 °C

Humidity : 53.4 %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

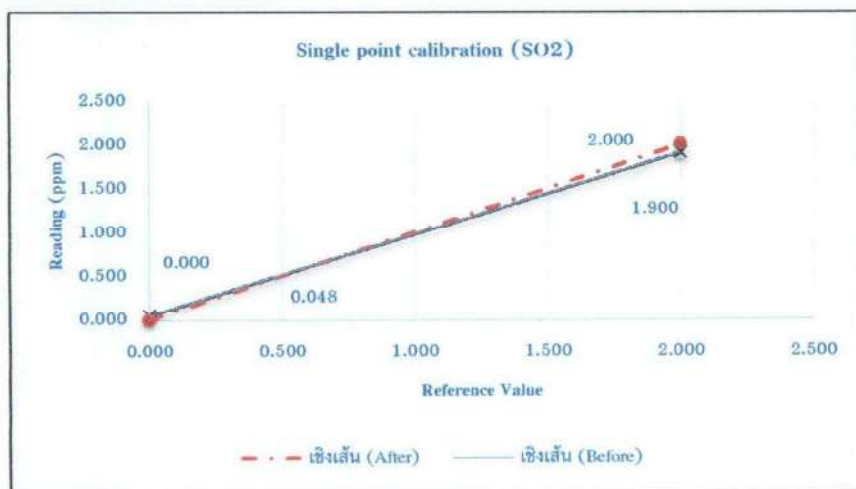
SO2 Conc. : 2 ppm

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	0.048	0.000	0.05	1.90	2.000	-5.00
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 : 30-Aug-22

Certificate No. : 0822-005

Page : 1/1

Analyzer Instruments

Analyzer Type : SO2 Analyzer

Manufacturer : Thermo Environmental

Model : 43C

Serial No. : 70853-367

Environmental

Temperature : 25.7 °C

Humidity : 54.1 %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

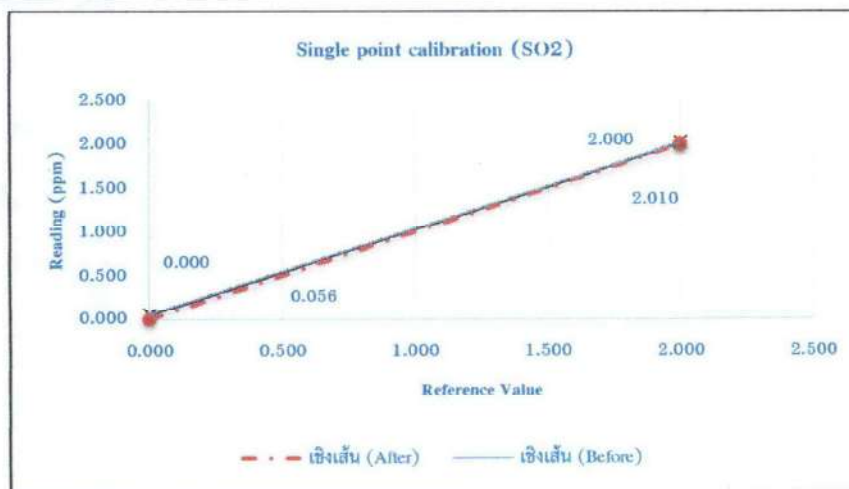
SO2 Conc. : 2 ppm

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	0.056	0.000	0.06	2.01	2.000	0.50
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 : 3-Oct-22

Certificate No. : 1022-001

Page : 1/1

Analyzer Instruments

Analyzer Type : SO2 Analyzer

Manufacturer : Thermo Environmental

Model : 43C

Serial No. : CTT 63588-340

Environmental

Temperature : 24.1 °C

Humidity : 52.1 %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

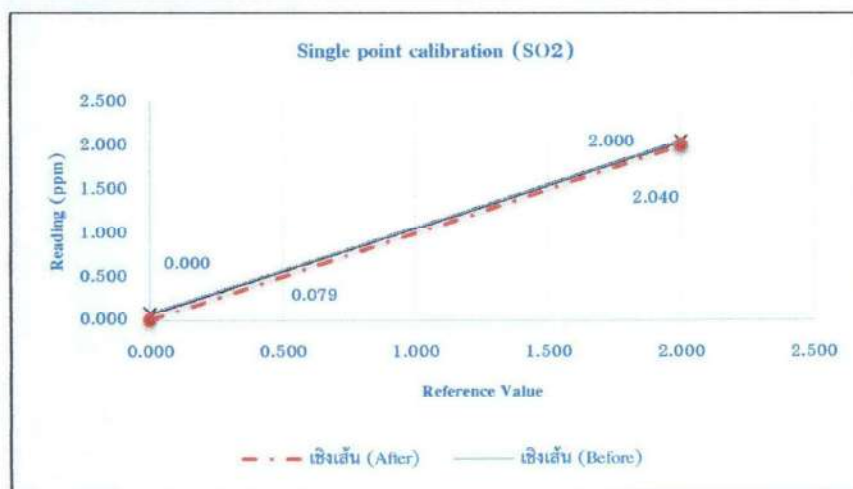
SO2 Conc. : 2 ppm

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	0.079	0.000	0.08	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 : 1-Sep-22

Certificate No. : 0922-002

Page : 1/1

Analyzer Instruments

Analyzer Type : SO2 Analyzer

Manufacturer : Thermo Environmental

Model : 43C

Serial No. : 77419-385

Environmental

Temperature : 25.2 °C

Humidity : 52.0 %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

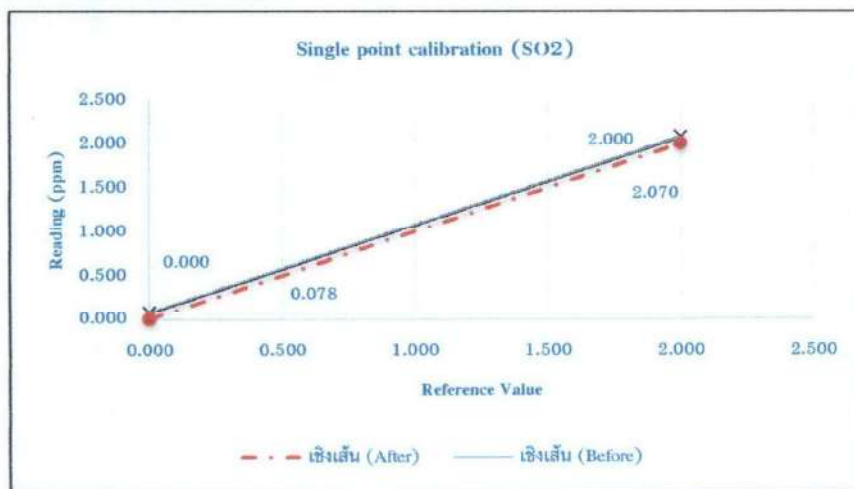
SO2 Conc. : 2 ppm

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	0.078	0.000	0.08	2.07	2.000	3.50
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 : 26-Aug-23

Certificate No. : 0823-001

Page : 1/1

Analyzer Instruments

Analyzer Type : NO/NO/NO_x Analyzer

Manufacturer : Thermo Environmental

Model : 42C

Serial No. : 66193-351

Environmental

Temperature : 25.3 °C

Humidity : 40.2 %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

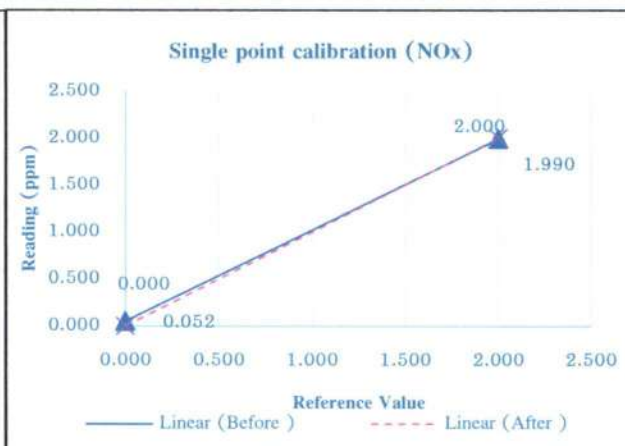
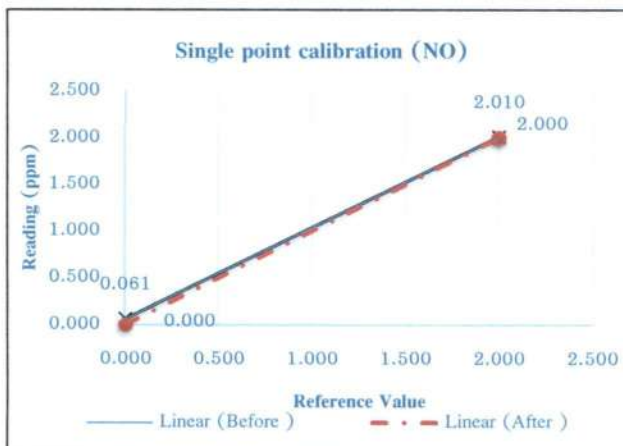
SO₂ : 2 ppm

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
NO _x	0.052	0.000	0.05	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)

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

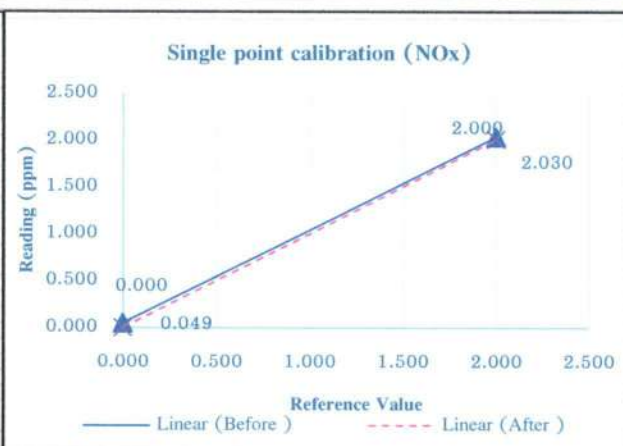
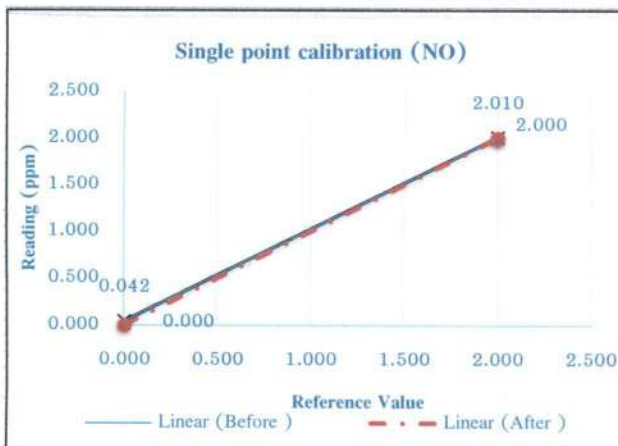
SO₂ : 2 ppm

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)

Certificate of Analyzer Performance Testing

Calibrated Date : 4-Aug-23

Certificate No. : 0823-003

Page : 1/1

Analyzer Instruments

Analyzer Type : NO/NO₂/NO_x Analyzer
Model : 42C

Manufacturer : Thermo Environmental
Serial No. : 59406-323

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

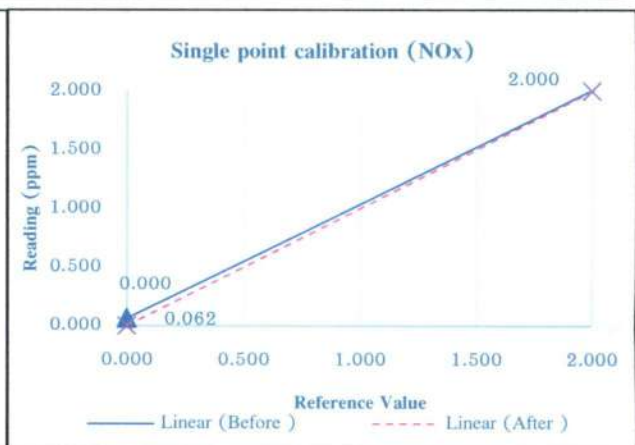
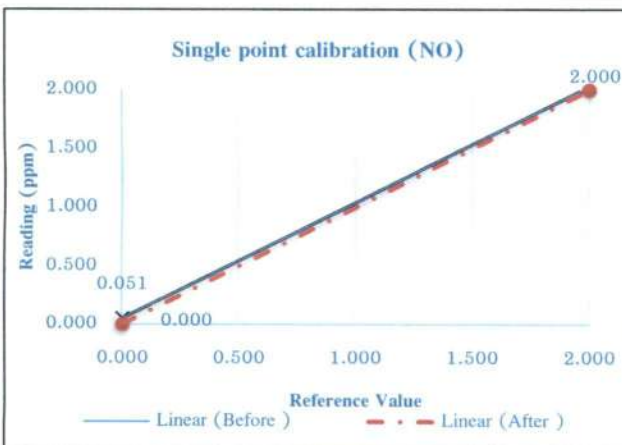
Standard Gas

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


Cylinder No. : 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	0.051	0.000	0.05	2.03	2.00	1.50
NO _x	0.062	0.000	0.06	2.01	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)

Certificate of Analyzer Performance Testing

Calibrated Date : 1-Sep-22

Certificate No. : 0922-003

Page : 1/1

Analyzer Instruments

Analyzer Type : NO/NO/NOx Analyzer

Manufacturer : Thermo Environmental

Model : 42C

Serial No. : 66193-351

Environmental

Temperature : 26.7 °C

Humidity : 56.9 %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

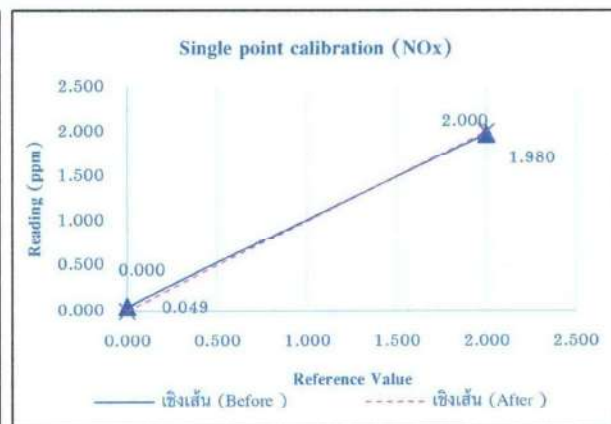
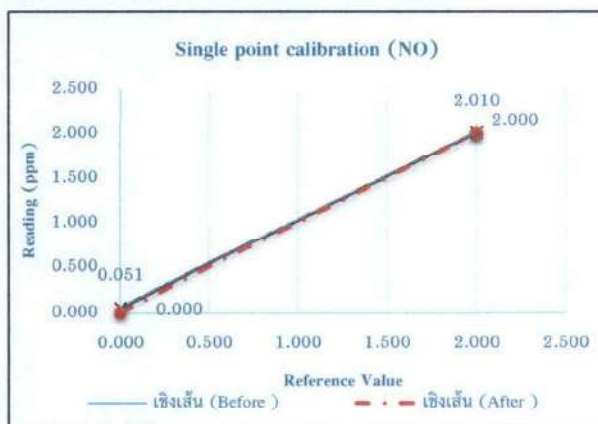
SO2 : 2 ppm

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	0.051	0.000	0.05	2.01	2.00	0.50
NOx	0.049	0.000	0.05	1.98	2.00	-1.00
After						
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



Calibrated by :

Tong
(Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 6-Apr-22

Certificate No. : 0422-055

Page : 1/1

Analyzer Instruments

Analyzer Type : NO/NO₂/Nox Analyzer

Manufacturer : Thermo Environmental

Model : 42C

Serial No. : 72454-371

Environmental

Temperature : 25.4 °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

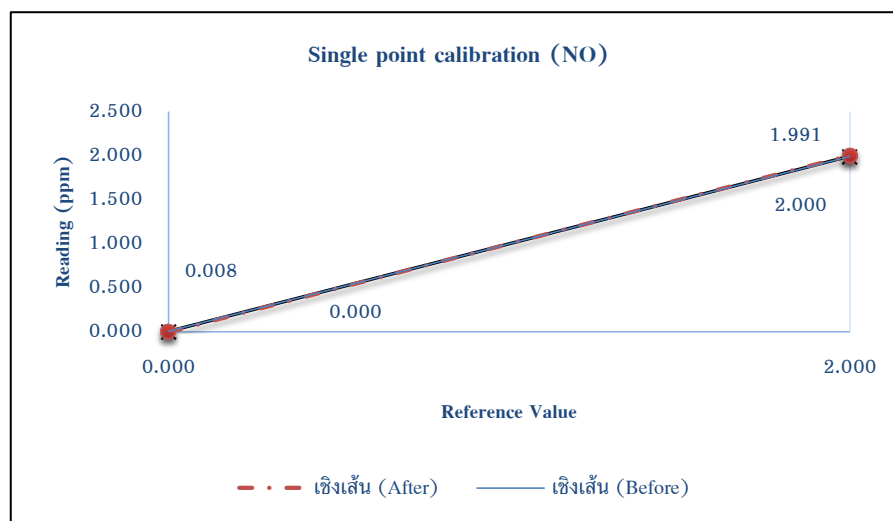
SO₂ Conc. : 2 ppm

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						
NO	0.008	0.000	0.01	1.991	2.000	-0.45
NO _x	0.012	0.000	0.01	2.012	2.000	0.60
After						
NO	0.000	0.000	0.00	2.000	2.000	0.00
NO _x	0.000	0.000	0.00	2.000	2.000	0.00



Calibrated by :


 (Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 11-Jul-22

Certificate No. : 0722-001

Page : 1/1

Analyzer Instruments

Analyzer Type : NO/NO/NOx Analyzer

Manufacturer : Thermo Environmental

Model : 42C

Serial No. : 63470-339

Environmental

Temperature : 25.0 °C

Humidity : 52.0 %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

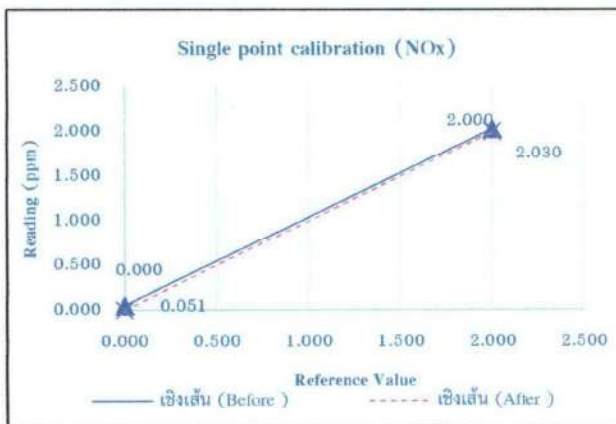
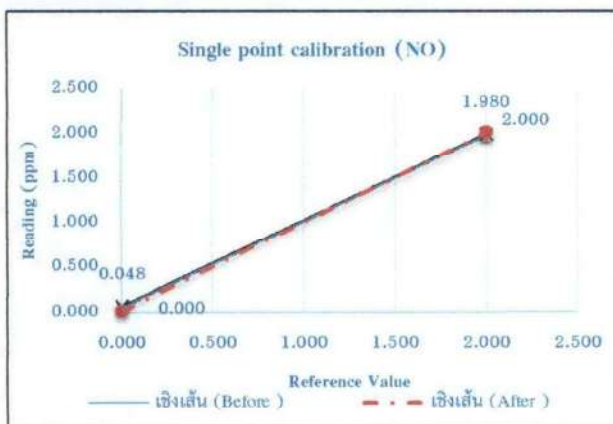
SO2 : 2 ppm

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	0.048	0.000	0.05	1.98	2.00	-1.00
NOx	0.051	0.000	0.05	2.03	2.00	1.50
After						
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



Calibrated by :


 (Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 9-Aug-22

Certificate No. : 0822-003

Page : 1/1

Analyzer Instruments

Analyzer Type : NO/NO/NOx Analyzer

Manufacturer : Thermo Environmental

Model : 42C

Serial No. : 59406-323

Environmental

Temperature : 24.2 °C

Humidity : 50.4 %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

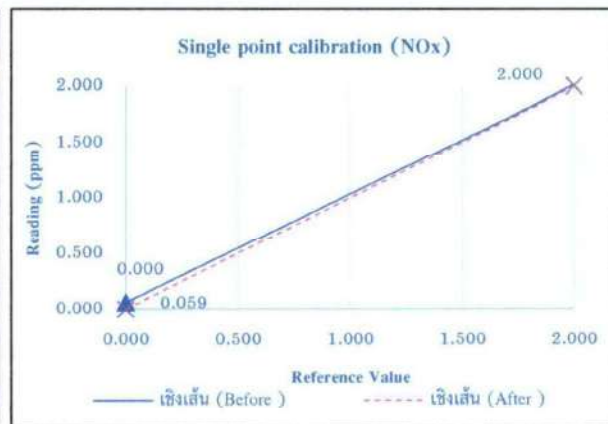
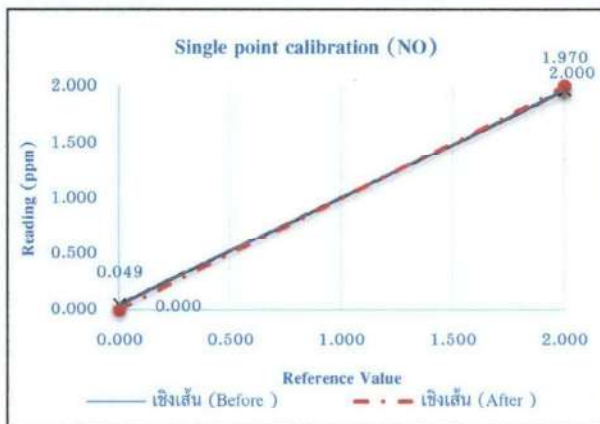
SO₂ : 2 ppm

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	0.049	0.000	0.05	1.97	2.00	-1.50
NOx	0.059	0.000	0.06	2.01	2.00	0.50
After						
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



Calibrated by :


(Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 30-Jan-23

Certificate No. : 0123-001

Page : 1/1

Analyzer Instruments

Analyzer Type : THC Analyzer

Manufacturer : Thermo Environmental

Model : 51

Serial No. : 51HT-73244-373

Environmental

Temperature : 24.7 °C

Humidity : 54.4 %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

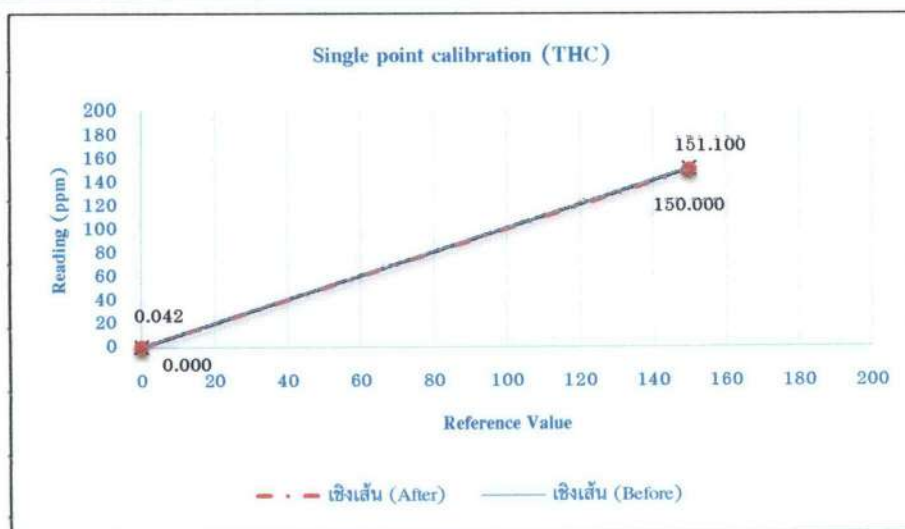
Propane Conc. : 150 ppm

Cylinder No. : 21W281046

Expire Date : 26-Sep-25

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
THC	0.042	0.000	0.042	151	150	0.733
After						
THC	0.000	0.000	0.000	150	150	0.000



Calibrated by :

Tong Piima

(Mr. Tong Piima)

Certificate of Analyzer Performance Testing

Calibrated Date : 30-Jan-23

Certificate No. : 0123-002

Page : 1/1

Analyzer Instruments

Analyzer Type : THC Analyzer

Manufacturer : Baseline

Model : Series 8800

Serial No. : 584

Environmental

Temperature : 24.5 °C

Humidity : 56.3 %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

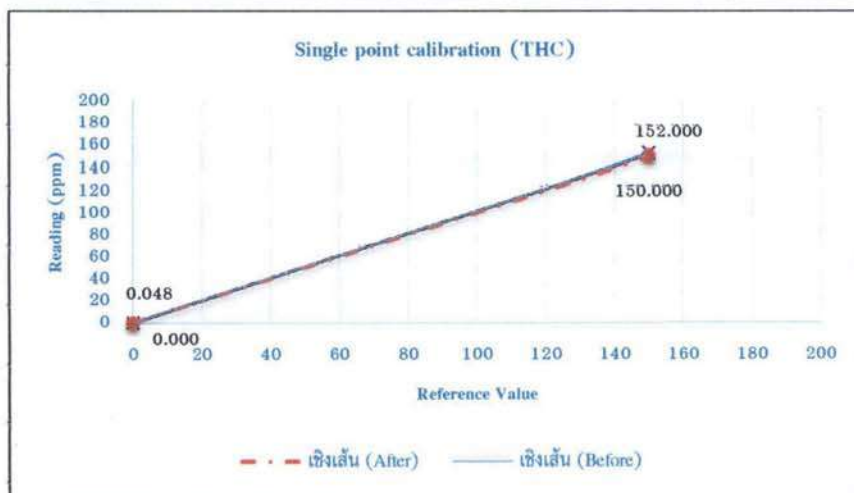
Propane Conc. : 150 ppm

Cylinder No. : 21W281046

Expire Date : 26-Sep-25

Calibration Check

Gas	Zero			Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (%)	Reading Value (ppm)	Expected Value (ppm)	Drift (%)
Before						
THC	0.048	0.000	0.048	152	150	1.333
After						
THC	0.000	0.000	0.000	150	150	0.000



Calibrated by :

Tong Piima
(Mr. Tong Piima)

เอกสารการสอบเทียบเครื่องมือตรวจวัดความชื้นสะท้อน

Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM20453

Calibration Date: April 21, 2023

Calibration Reference Equipment: SRV-AFR 714J7401

*Calibrated with Geo UM6231

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard.

Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By: _____

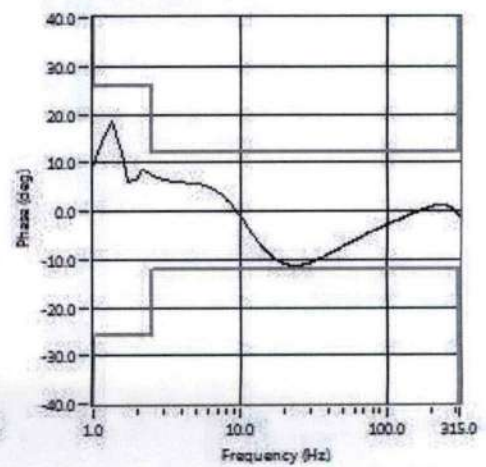
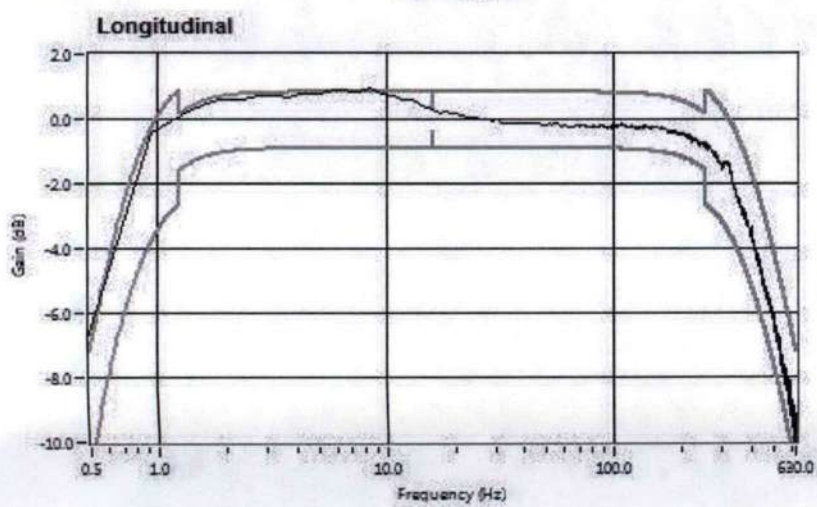
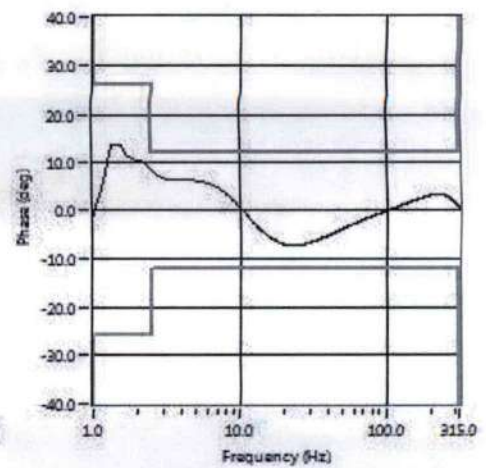
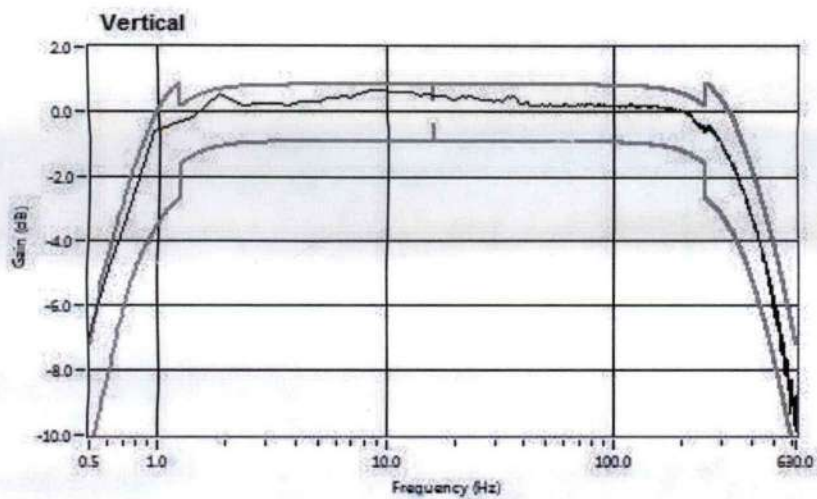
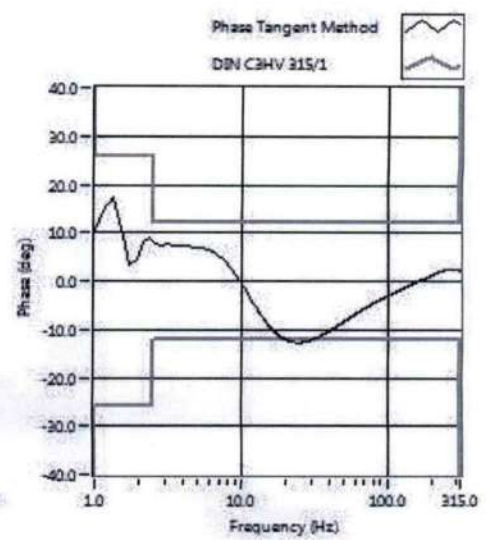
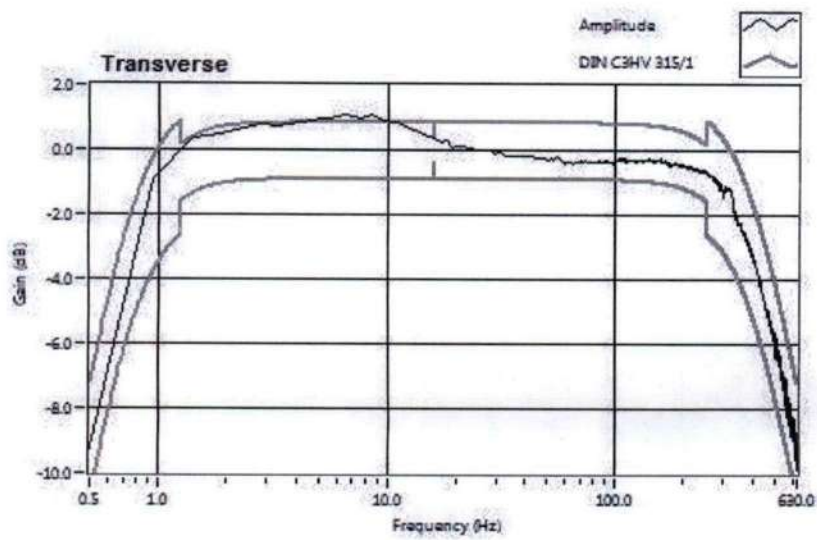
Yaksh Patel



Instantel®

309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642

Frequency Response of UM20453 (As Found)



Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM21467

Calibration Date: MAY 29 2023

Calibration Reference Equipment: 714J7403

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By: _____

Xiaoming Yang



309 Legget Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642



Merci d'avoir choisi Instantel!

Votre engagement avec
« les moniteurs les plus fiables au monde »
vous servira pour les années à venir.

Grâce à votre achat, vous êtes à la pointe de la technologie en matière de moniteurs. Au nom de tous les collaborateurs d'Instantel, nous vous remercions d'avoir fait choisir nos produits pour la réalisation de vos projets. Les produits Instantel incluent les éléments les plus aboutis du domaine tels que:

- 1) Plus de 30 années au service des secteurs du bâtiment, d'activités minières et de géotechnologie
- 2) Des conceptions durables et résistantes
- 3) Des produits faciles à utiliser grâce à une interface intuitive
- 4) Des options étendues de conformité réglementaire
- 5) Un programme d'assistance, un service technique et une aide en ligne complets
- 6) Logiciel THOR® disponible en téléchargement gratuit sur le site Web d'Instantel: www.instantel.com
- 7) Garantie d'un an sur les pièces; si un moniteur ou un capteur est ramené à l'usine pour étalonnage jusqu'à un an après la date d'achat, la garantie sera automatiquement prolongée d'un an supplémentaire

Instantel est **RESPECTUEUX DE L'ENVIRONNEMENT!** Instantel n'envoie plus de manuels en version papier. Les manuels de l'opérateur pour chaque produit et pour THOR sont disponibles en téléchargement sur le site Web d'Instantel à l'adresse www.instantel.com/resources.

Nous nous engageons pour que votre satisfaction en tant que client soit la meilleure possible. En cas de questions ou de commentaires, n'hésitez pas à nous contacter. Veuillez appeler notre numéro gratuit **+1 800 267 9111** ou nous envoyer un e-mail à service@instantel.com ou sales@instantel.com.

Nous vous remercions de nouveau et avons hâte de collaborer avec vous!

Certificate No.: CP20230379EA

Operation No.: CP2023100002

Certificate of Calibration

Equipment: Vibration Meter

Manufacturer: Instantel

Model/Type: Micromate

Serial No.: UM14163

ID No.: VB-01-001

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

Address: 31/8 Moo 13 T.Rai Khung, A.Sam Phran,
Nakorn Phatom 73210

Received Date: 6 October 2023

Calibrated Date: 18 - 20 October 2023

Issued Date: 31 October 2023

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.: CP20230379EA

Calibration Report

Equipment: Vibration Meter
Manufacturer: Instantel
Model: Micromate
Serial No.: UM14163
ID No.: VB-01-001
Ambient Temperature: (23 ± 5) °C
Relative Humidity: (50 ± 15) %

Method of Calibration :-

In-house method : CC-SV004 by comparison with standard accelerometer.

Condition of this result of calibration

1. Reference standards instrument :-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Standard Accelerometer	8305	2708237	AV-0001-23	20-Jul-2024
2) Measuring Amplifier	2525	2685967	AV-0044-23	20-Jul-2024
3) PULSE Multi-analyzer system	3560-C	2705645	CQ20230003EA	25-Dec-2023
4) Humidity and Temperature Transmitter	HMT331	K3810009	CD20230166EA	14-Jun-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 :-

- National Institute of Metrology (Thailand)

Certificate No.: CP20230379EA

Calibration Report

Result of Calibration:-

Function : Frequency response and Linearity test at 16 Hz

Frequency (Hz)	Nominal (mm/s)	Standard (mm/s)	UUC (mm/s)	Deviation (mm/s)	Uncertainty \pm (%)	Direction
4.0	10.000	10.006	10.412	0.406	1.50	Longitudinal (L)
5.0	10.000	9.984	10.254	0.270	1.50	
6.3	10.000	9.991	10.483	0.492	1.50	
8.0	10.000	10.013	10.215	0.202	1.50	
10.0	10.000	10.008	10.199	0.191	1.50	
12.5	10.000	10.000	10.104	0.104	1.50	
16.0	10.000	9.993	10.073	0.080	1.50	
	20.000	19.983	20.146	0.163	1.50	
	30.000	29.995	30.219	0.224	1.50	
	50.000	49.992	50.396	0.404	1.50	
20.0	10.000	10.006	10.112	0.106	1.50	
25.0	10.000	10.003	10.097	0.094	1.50	
31.5	10.000	10.000	10.160	0.160	1.50	
40.0	10.000	10.008	10.302	0.294	1.50	
50.0	10.000	10.006	10.357	0.351	1.50	
52.0	10.000	9.994	10.412	0.418	1.50	
63.0	10.000	10.008	10.711	0.703	1.50	
80.0	10.000	9.984	11.097	1.113	1.50	

Certificate No.: CP20230379EA

Calibration Report

Function : Frequency response and Linearity test at 16 Hz (Cont.)

Frequency (Hz)	Nominal (mm/s)	Standard (mm/s)	UUC (mm/s)	Deviation (mm/s)	Uncertainty ± (%)	Direction
4.0	10.000	9.997	10.372	0.375	1.50	Transverse (T)
5.0	10.000	9.991	10.325	0.334	1.50	
6.3	10.000	10.000	10.501	0.501	1.50	
8.0	10.000	10.008	10.357	0.349	1.50	
10.0	10.000	10.015	10.294	0.279	1.50	
12.5	10.000	9.997	10.231	0.234	1.50	
16.0	10.000	10.004	10.191	0.187	1.50	
	20.000	20.011	20.248	0.237	1.50	
	30.000	29.995	30.298	0.303	1.50	
	50.000	49.978	50.562	0.584	1.50	
20.0	10.000	10.001	10.144	0.143	1.50	
25.0	10.000	9.997	10.120	0.123	1.50	
31.5	10.000	9.998	10.144	0.146	1.50	
40.0	10.000	10.013	10.246	0.233	1.50	
50.0	10.000	9.991	10.388	0.397	1.50	
52.0	10.000	10.006	10.404	0.398	1.50	
63.0	10.000	10.013	10.696	0.683	1.50	
80.0	10.000	9.991	11.098	1.107	1.50	

Certificate No.: CP20230379EA

Calibration Report

Function : Frequency response and Linearity test at 16 Hz (Cont.)

Frequency (Hz)	Nominal (mm/s)	Standard (mm/s)	UUC (mm/s)	Deviation (mm/s)	Uncertainty ± (%)	Direction
4.0	10.000	10.008	10.002	-0.006	1.50	Vertical (V)
5.0	10.000	9.991	10.136	0.145	1.50	
6.3	10.000	9.997	10.365	0.368	1.50	
8.0	10.000	10.008	10.270	0.262	1.50	
10.0	10.000	9.990	10.278	0.288	1.50	
12.5	10.000	9.997	10.238	0.241	1.50	
16.0	10.000	9.994	10.175	0.181	1.50	
	20.000	19.997	20.445	0.448	1.50	
	30.000	29.995	30.597	0.602	1.50	
	50.000	49.992	51.043	1.051	1.50	
20.0	10.000	10.003	10.231	0.228	1.50	
25.0	10.000	9.997	9.726	-0.271	1.50	
31.5	10.000	10.000	10.057	0.057	1.50	
40.0	10.000	9.996	10.168	0.172	1.50	
50.0	10.000	9.996	10.199	0.203	1.50	
52.0	10.000	9.994	10.309	0.315	1.50	
63.0	10.000	9.984	10.396	0.412	1.50	
80.0	10.000	9.998	10.672	0.674	1.50	

Remark

1. UUC: Unit Under Calibration
2. The coverage factor $k = 2.00$

- - End of Report - -



**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

Certificate No.: CP20220309EA

Operation No.: CP2022090011

Certificate of Calibration

Equipment: Vibration Meter

Manufacturer: Instantel

Model/Type: Micromate

Serial No.: UM14163

ID No.: VB-01-001

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

Address: 31/8 Moo 13 T.Rai Khung, A.Sam Phran,
Nakorn Phatom 73210

Received Date: 15 September 2022

Calibrated Date: 4 - 6 October 2022

Issued Date: 12 October 2022

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.: CP20220309EA

Calibration Report

Equipment: Vibration Meter
 Manufacturer: Instantel
 Model: Micromate
 Serial No.: UM14163
 ID No.: VB-01-001
 Ambient Temperature: (23 ± 5) °C
 Relative Humidity: (50 ± 15) %

Method of Calibration :-

In-house method : CC-SV004 by comparison with standard accelerometer.

Condition of this result of calibration

1. Reference standards instrument :-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Standard Accelerometer	8305	2708237	AV-0010-21	30-Nov-2022
2) Measuring Amplifier	2525	3016651	AV-0007-22	9-Jun-2023
3) PULSE Multi-analyzer system	3050-A-060	2705645	CQ20210015EA	1-Dec-2022
4) Pressure humidity and Temperature Transmitter	HMT331	K3810009	CD20220120EA	22-Apr-2023

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 :-

- National Institute of Metrology (Thailand)

Certificate No.: CP20220309EA

Calibration Report

Result of Calibration:-

Function : Frequency response and Linearity test at 16 Hz

Frequency (Hz)	Nominal (mm/s)	Standard (mm/s)	UUC (mm/s)	Deviation (mm/s)	Uncertainty \pm (%)	Direction
4.0	10	9.993	9.553	-0.440	1.5	Longitudinal (L)
5.0	10	9.994	9.742	-0.252	1.5	
6.3	10	10.013	10.049	0.036	1.5	
8.0	10	10.007	9.915	-0.092	1.5	
10.0	10	9.996	9.931	-0.065	1.5	
12.5	10	9.998	9.892	-0.106	1.5	
16.0	10	10.011	9.947	-0.064	1.5	
	20	19.983	19.917	-0.066	1.5	
	30	29.995	29.904	-0.091	1.5	
	50	50.021	49.955	-0.066	1.5	
20.0	10	10.001	9.939	-0.062	1.5	
25.0	10	9.997	9.947	-0.050	1.5	
31.5	10	9.997	9.907	-0.090	1.5	
40.0	10	10.010	9.876	-0.134	1.5	
50.0	10	10.015	9.837	-0.178	1.5	
52.0	10	10.008	9.789	-0.219	1.5	
63.0	10	10.013	9.781	-0.232	1.5	
80.0	10	10.001	9.710	-0.291	1.5	

Certificate No.: CP20220309EA

Calibration Report

Function : Frequency response and Linearity test at 16 Hz (Cont.)

Frequency (Hz)	Nominal (mm/s)	Standard (mm/s)	UUC (mm/s)	Deviation (mm/s)	Uncertainty ± (%)	Direction
4.0	10	9.984	9.671	-0.313	1.5	Transverse (T)
5.0	10	10.024	9.876	-0.148	1.5	
6.3	10	9.989	10.223	0.234	1.5	
8.0	10	9.996	10.049	0.053	1.5	
10.0	10	10.010	10.112	0.102	1.5	
12.5	10	10.003	10.057	0.054	1.5	
16.0	10	10.008	10.018	0.010	1.5	
	20	19.997	20.107	0.110	1.5	
	30	29.995	30.116	0.121	1.5	
	50	49.978	50.239	0.261	1.5	
20.0	10	9.997	9.978	-0.019	1.5	
25.0	10	9.994	9.963	-0.031	1.5	
31.5	10	9.996	9.900	-0.096	1.5	
40.0	10	10.008	9.829	-0.179	1.5	
50.0	10	10.013	9.750	-0.263	1.5	
52.0	10	10.001	9.758	-0.243	1.5	
63.0	10	9.997	9.734	-0.263	1.5	
80.0	10	9.990	9.742	-0.248	1.5	

Certificate No.: CP20220309EA

Calibration Report

Function : Frequency response and Linearity test at 16 Hz (Cont.)

Frequency (Hz)	Nominal (mm/s)	Standard (mm/s)	UUC (mm/s)	Deviation (mm/s)	Uncertainty ± (%)	Direction
4.0	10	10.004	9.797	-0.207	1.5	Vertical (V)
5.0	10	9.998	10.010	0.012	1.5	
6.3	10	10.003	10.428	0.425	1.5	
8.0	10	10.007	10.357	0.350	1.5	
10.0	10	10.004	10.388	0.384	1.5	
12.5	10	10.004	10.357	0.353	1.5	
16.0	10	10.004	10.333	0.329	1.5	
	20	19.997	20.832	0.835	1.5	
	30	30.010	31.173	1.163	1.5	
	50	49.964	51.957	1.993	1.5	
20.0	10	10.000	10.317	0.317	1.5	
25.0	10	10.001	9.931	-0.070	1.5	
31.5	10	10.001	10.215	0.214	1.5	
40.0	10	10.006	10.278	0.272	1.5	
50.0	10	10.003	10.357	0.354	1.5	
52.0	10	9.983	10.396	0.413	1.5	
63.0	10	9.977	10.483	0.506	1.5	
80.0	10	10.020	11.775	1.755	1.5	

Remark

1. UUC: Unit Under Calibration
2. The coverage factor $k = 2.00$

-- End of Report --

Certificate No.: CP20230080EA

Operation No.: CP2022100031

Certificate of Calibration

Equipment: Vibration Meter

Manufacturer: Instantel

Model/Type: Micromate

Serial No.: UM15904

ID No.: VB-01-002

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

Address: 31/8 Moo 13 T.Rai Khung, A.Sam Phran,
Nakorn Phatom 73210

Received Date: 26 October 2022

Calibrated Date: 7 - 9 February 2023

Issued Date: 15 February 2023

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.: CP20230080EA

Calibration Report

Equipment: Vibration Meter
Manufacturer: Instantel
Model: Micromate
Serial No.: UM15904
ID No.: VB-01-002
Ambient Temperature: (23 ± 5) °C
Relative Humidity: (50 ± 15) %

Method of Calibration :-

In-house method : CC-SV004 by comparison with standard accelerometer.

Condition of this result of calibration

1. Reference standards instrument :-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Standard Accelerometer	8305-001	30120	AV-0013-21	30-May-2023
2) Measuring Amplifier	2525	3016651	AV-0007-22	9-Jun-2023
3) PULSE Multi-analyzer system	3560-C	2705645	CQ20230003EA	25-Dec-2023
4) Humidity and Temperature Transmitter	HMT331	K3810009	CD20220120EA	22-Apr-2023

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 :-

- National Institute of Metrology (Thailand)

Certificate No.: CP20230080EA

Calibration Report

Result of Calibration:-

Function : Frequency response and Linearity test at 16 Hz

Frequency (Hz)	Nominal (mm/s)	Standard (mm/s)	UUC (mm/s)	Deviation (mm/s)	Uncertainty \pm (%)	Direction
4.0	10.000	9.997	10.514	0.517	1.50	Longitudinal (L)
5.0	10.000	10.027	10.908	0.881	1.50	
6.3	10.000	10.015	10.813	0.798	1.50	
8.0	10.000	10.027	10.489	0.462	1.50	
10.0	10.000	9.986	10.483	0.497	1.50	
12.5	10.000	10.003	10.341	0.338	1.50	
16.0	10.000	9.984	10.215	0.231	1.50	
	20.000	20.025	20.248	0.223	1.50	
	30.000	29.981	30.298	0.317	1.50	
	50.000	49.922	50.507	0.585	1.50	
20.0	10.000	9.996	10.199	0.203	1.50	
25.0	10.000	9.980	10.191	0.211	1.50	
31.5	10.000	9.974	10.183	0.209	1.50	
40.0	10.000	10.006	10.270	0.264	1.50	
50.0	10.000	10.000	10.199	0.199	1.50	
52.0	10.000	10.013	10.286	0.273	1.50	
63.0	10.000	9.976	10.325	0.349	1.50	
80.0	10.000	9.976	10.317	0.341	1.50	

Certificate No.: CP20230080EA

Calibration Report

Function : Frequency response and Linearity test at 16 Hz (Cont.)

Frequency	Nominal	Standard	UUC	Deviation	Uncertainty	Direction
(Hz)	(mm/s)	(mm/s)	(mm/s)	(mm/s)	± (%)	
4.0	10.000	10.055	10.656	0.601	1.50	Transverse (T)
5.0	10.000	10.015	10.593	0.578	1.50	
6.3	10.000	9.979	10.743	0.764	1.50	
8.0	10.000	10.034	10.412	0.378	1.50	
10.0	10.000	9.969	10.341	0.372	1.50	
12.5	10.000	9.990	10.254	0.264	1.50	
16.0	10.000	9.998	10.238	0.240	1.50	
	20.000	19.983	20.304	0.321	1.50	
	30.000	29.995	30.455	0.460	1.50	
	50.000	50.007	50.633	0.626	1.50	
20.0	10.000	10.027	10.238	0.211	1.50	
25.0	10.000	9.984	10.183	0.199	1.50	
31.5	10.000	9.986	10.199	0.213	1.50	
40.0	10.000	9.994	10.215	0.221	1.50	
50.0	10.000	9.976	10.231	0.255	1.50	
52.0	10.000	9.980	10.286	0.306	1.50	
63.0	10.000	9.970	10.380	0.410	1.50	
80.0	10.000	9.994	10.467	0.473	1.50	

Certificate No.: CP20230080EA

Calibration Report

Function : Frequency response and Linearity test at 16 Hz (Cont.)

Frequency	Nominal	Standard	UUC	Deviation	Uncertainty	Direction
(Hz)	(mm/s)	(mm/s)	(mm/s)	(mm/s)	± (%)	
4.0	10.000	9.966	9.718	-0.248	1.50	Vertical (V)
5.0	10.000	10.028	10.223	0.195	1.50	
6.3	10.000	9.969	10.388	0.419	1.50	
8.0	10.000	10.006	10.041	0.035	1.50	
10.0	10.000	9.993	9.971	-0.022	1.50	
12.5	10.000	9.979	9.947	-0.032	1.50	
16.0	10.000	10.004	10.049	0.045	1.50	
	20.000	19.969	20.012	0.043	1.50	
	30.000	29.981	29.888	-0.093	1.50	
	50.000	49.978	49.868	-0.110	1.50	
20.0	10.000	10.015	10.152	0.137	1.50	
25.0	10.000	9.977	9.655	-0.322	1.50	
31.5	10.000	10.014	10.081	0.067	1.50	
40.0	10.000	10.020	10.238	0.218	1.50	
50.0	10.000	10.031	10.380	0.349	1.50	
52.0	10.000	9.982	10.294	0.312	1.50	
63.0	10.000	9.987	10.428	0.441	1.50	
80.0	10.000	9.994	10.751	0.757	1.50	

Remark

1. UUC: Unit Under Calibration
2. The coverage factor $k = 2.00$

-- End of Report --

Certificate No.: CP20230148EA

Operation No.: CP2023020060

Certificate of Calibration

Equipment: Vibration Meter

Manufacturer: Instantel

Model/Type: Micromate

Serial No.: UM16048

ID No.: VB-01-003

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

Address: 31/8 Moo 13 T.Rai Khung, A.Sam Phran,
Nakorn Phatom 73210

Received Date: 28 February 2023

Calibrated Date: 7 - 9 March 2023

Issued Date: 14 March 2023

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.: CP20230148EA

Calibration Report

Equipment: Vibration Meter
Manufacturer: Instantel
Model: Micromate
Serial No.: UM16048
ID No.: VB-01-003
Ambient Temperature: (23 ± 5) °C
Relative Humidity: (50 ± 15) %

Method of Calibration :-

In-house method : CC-SV004 by comparison with standard accelerometer.

Condition of this result of calibration

1. Reference standards instrument :-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Standard Accelerometer	8305-001	30120	AV-0013-21	30-May-2023
2) Measuring Amplifier	2525	3016651	AV-0007-22	9-Jun-2023
3) PULSE Multi-analyzer system	3560-C	2705645	CQ20230003EA	25-Dec-2023
4) Humidity and Temperature Transmitter	HMT331	K3810009	CD20220120EA	22-Apr-2023

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 :-

- National Institute of Metrology (Thailand)

Certificate No.: CP20230148EA

Calibration Report

Result of Calibration:-

Function : Frequency response and Linearity test at 16 Hz

Frequency (Hz)	Nominal (mm/s)	Standard (mm/s)	UUC (mm/s)	Deviation (mm/s)	Uncertainty \pm (%)	Direction
4.0	10.000	10.008	10.554	0.546	1.50	Longitudinal (L)
5.0	10.000	10.004	10.514	0.510	1.50	
6.3	10.000	10.007	10.633	0.626	1.50	
8.0	10.000	10.008	10.365	0.357	1.50	
10.0	10.000	10.006	10.341	0.335	1.50	
12.5	10.000	9.997	10.262	0.265	1.50	
16.0	10.000	9.998	10.262	0.264	1.50	
	20.000	19.997	20.548	0.551	1.50	
	30.000	29.995	30.786	0.791	1.50	
	50.000	49.992	51.153	1.161	1.50	
20.0	10.000	10.003	10.294	0.291	1.50	
25.0	10.000	10.000	10.341	0.341	1.50	
31.5	10.000	10.010	10.372	0.362	1.50	
40.0	10.000	9.998	10.420	0.422	1.50	
50.0	10.000	10.017	10.428	0.411	1.50	
52.0	10.000	10.001	10.522	0.521	1.50	
63.0	10.000	10.010	10.688	0.678	1.50	
80.0	10.000	10.004	10.680	0.676	1.50	

Certificate No.: CP20230148EA

Calibration Report

Function : Frequency response and Linearity test at 16 Hz (Cont.)

Frequency	Nominal	Standard	UUC	Deviation	Uncertainty	Direction
(Hz)	(mm/s)	(mm/s)	(mm/s)	(mm/s)	± (%)	
4.0	10.000	9.970	10.853	0.883	1.50	Transverse (T)
5.0	10.000	9.998	10.869	0.871	1.50	
6.3	10.000	10.000	10.901	0.901	1.50	
8.0	10.000	10.003	10.538	0.535	1.50	
10.0	10.000	10.000	10.467	0.467	1.50	
12.5	10.000	10.004	10.412	0.408	1.50	
16.0	10.000	10.001	10.428	0.427	1.50	
	20.000	19.997	20.761	0.764	1.50	
	30.000	29.995	31.031	1.036	1.50	
	50.000	49.978	51.516	1.538	1.50	
20.0	10.000	10.008	10.491	0.483	1.50	
25.0	10.000	10.000	10.475	0.475	1.50	
31.5	10.000	10.008	10.530	0.522	1.50	
40.0	10.000	10.004	10.609	0.605	1.50	
50.0	10.000	9.994	10.593	0.599	1.50	
52.0	10.000	10.001	10.688	0.687	1.50	
63.0	10.000	10.008	10.845	0.837	1.50	
80.0	10.000	10.008	10.940	0.932	1.50	

Certificate No.: CP20230148EA

Calibration Report

Function : Frequency response and Linearity test at 16 Hz (Cont.)

Frequency (Hz)	Nominal (mm/s)	Standard (mm/s)	UUC (mm/s)	Deviation (mm/s)	Uncertainty ± (%)	Direction
4.0	10.000	10.006	10.711	0.705	1.50	Vertical (V)
5.0	10.000	10.003	10.554	0.551	1.50	
6.3	10.000	10.008	10.562	0.554	1.50	
8.0	10.000	9.991	10.128	0.137	1.50	
10.0	10.000	10.008	10.065	0.057	1.50	
12.5	10.000	10.001	10.057	0.056	1.50	
16.0	10.000	10.004	10.065	0.061	1.50	
	20.000	19.997	20.114	0.117	1.50	
	30.000	30.010	30.148	0.138	1.50	
	50.000	49.992	50.269	0.277	1.50	
20.0	10.000	9.993	10.175	0.182	1.50	
25.0	10.000	10.003	9.766	-0.237	1.50	
31.5	10.000	10.003	10.120	0.117	1.50	
40.0	10.000	10.006	10.262	0.256	1.50	
50.0	10.000	10.001	10.333	0.332	1.50	
52.0	10.000	10.000	10.374	0.374	1.50	
63.0	10.000	9.998	10.451	0.453	1.50	
80.0	10.000	10.001	10.751	0.750	1.50	

Remark 1. UUC: Unit Under Calibration
2. The coverage factor $k = 2.00$

-- End of Report --

เอกสารการสอบเทียบเครื่องมือตรวจวัดคุณภาพน้ำ



CERTIFICATE OF CONFORMITY

Aquion System

This certificate is to verify that the instrument referenced below by serial number meets or exceeds all Thermo Scientific functional specification and release requirements.

Instrument Serial Number: 221280114

Firmware Version: 3.1.0

Instrument Module Type: 22176-60018

Aquion Final Test

- ☒ Pump Calibration, Ripple and Accuracy
- ☒ Suppressor Current: Cal and Accuracy
- ☒ Column Heater: Cal and Check
- ☒ Detector Heater: Cal and Accuracy
- ☒ Conductivity Detector Cal, Noise and Linearity
- ☒ Degas Calibration

- ☒ Injection Valve Precision
- ☒ Relay and TTL I/O Test
- ☒ Injection Valve Functionality
- ☒ Leak Sensors
- ☒ Hi-Pot Test
- ☒ Eluent Generator Calibration

Tester's Signature: Angel Ruiz

Date: 22 Dec 2022

60-069566 Rev B

Aquion Pump Summary Test Report

Instrument Name	Model	Serial Number	Moduleware	
Module	Aquion	221280114	3. 1. 0	
Pump				
Detector		221260053		

Sequence Name: 1_Aquion_Pump_FOQ
 Sequence Run Date: 22 Dec 2022
 Sequence Comment: Aquion Pump Test Final

Flow Accuracy Test				
	Pressure	Flow Rate		
Test Run	Measured	Measured	Accuracy	<= 0.80%
Flow Accuracy: 1mL/min	2132	0.9988	0.115%	Pass
Flow Accuracy: 2mL/min	2467	1.9980	0.099%	Pass

Pressure Ripple Test			
	Pressure	Pressure Ripple	
Test Run	Measured	Measured	<= 0.30%
Flow Accuracy: 1mL/min	2132	0.080%	Pass
Flow Accuracy: 2mL/min	2467	0.121%	Pass

Angel Ruiz
 Test Technician

22 Dec 2022
 Date

Aquion Detector Summary Test Report

Instrument Name	Model	Serial Number	Moduleware
Module	Aquion	221280114	3. 1. 0
Pump			
Detector		221260053	

Sequence Name: 2_Aquion_Detector_FOQ
 Sequence Run Date: 22 Dec 2022
 Sequence Comment: AQUION Final Test Detector

Dummy Load				
	Cell Heater		Background Signal	
Test Run	Measured	34.8 - 35.2	Measured	18.9 - 23.1
Cell Dummy Load and Warm up	35.016	Pass	20.211	Pass

Detector Noise & Drift Test					
	Background Signal		Drift		Noise
Test Run	Measured	0.05 - 0.50 μ S	Measured	≤ 10.0 nS/hour	Measured ≤ 0.2 nS
Cell DI Water Noise and Drift	0.090 μ S	Pass	-4.715 nS/hour	Pass	0.139 nS Pass

Detector Linearity Test					
	Correlation Coefficient		%RSD		Calibration Curve
Test Run	Measured	≥ 0.999	Measured	≤ 5.0 %	Offset Slope
Cell Linearity Test 5 ppm	0.99998	Pass	4.30	Pass	0.000 0.553

Injector Precision Test						
	Area			Retention Time		
Test Run	Average	%RSD	$\leq 1\%$	Average	Max-Min	0.008 min
Injector Precision: 50 ppm	2.576 μ S*min	0.106%	Pass	0.373 min	0.0100 min	FAIL

Angel Ruiz
 Test Technician

22 Dec 2022

Date

Thermo Scientific Aquion System Calibration Summary

Instrument Name	Model	Serial Number	Moduleware	Calibration	Value
Module	Aquion	221280114	3.1.0	Column Calibration	12/22/2022

Column Heater	Column Calibration	
	Electrical Offset	0.000
	Heater Offset	1.95
	Heater Slope	1.02

Pump	Pressure Calibration	12/22/2022	Flow Rate Calibration	12/22/2022
	Pressure Transducer Offset	1576.00	Flow Rate Parameter	5.4
	Pressure Transducer Slope	0.363	Flow Rate Nominal Speed	3845
			Flow Rate Slope	0.93

Detector	Detector Calibration	12/22/2022	Cell Heater Calibration	12/22/2022
	Fine Offset	251260.77	Electrical Offset	0.000
	Fine Slope	0.000000025	Calibration Temperature	35.00
	Mid-Range Offset	28004.72	Cell Serial Number	221260053
	Mid-Range Slope	0.000000409		
	Coarse Offset	17014.44		
	Coarse Slope	0.000002016		
	Cell Constant	153.13		

China RoHS

Electrical and Electronic Products Restriction of Hazardous Substances Management Measures

For applicable products, the Hazardous Substance Information Table is located at:

<http://www.thermofisher.com/us/en/home/technical-resources/rohs-certificates.html>

CERT.No.: HS-T059I

Certificate of Calibration

Calibration Date : 1 Sep 22

Model : YSI 5000

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

S/N : 18L109487

219/43 Moo 12, Petchkasem Road, Omnoi, Krathumban,

Probe : YSI 5010

Samutsakorn 74130

S/N : 22G100123

ID NO. :

Avg Room Temp : 20 °C

Air Temp ref : S/N. E00522

Avg Water Temp : 20 °C

Barometric ref : S/N. E00522

Air Pressure : 760.00 mmHg

Water Temp ref : S/N. 11431

Salinity : 0 ppt

Technician : Kittipong M.

Calibration Details

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

Mean Measurement	9.09	mg/l	-	-
Inaccuracy	0.00	mg/l	-	-

Overall Status (PASS)

Manufacturer Specification

Accuracy = +/- 0.02 mg/l

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



Technician Signature



Laboratory Manager



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:

Teerapon Tawonwong

(Teerapon 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

Equipment:	Cooled Incubator	Certificate No.:	C31230380
Model:	KB 240	Issued Date:	21 February 2023
Serial No.(or ID):	20180000012164 (WW-16-001)	Job No.:	KSPR2302594
Manufacturer:	Binder	Page:	1 of 3
Condition:	In Condition	Ventilation Valve:	None
Shelves(pc.):	3		

Customer: C.E.M Technology (Thailand) Co., Ltd.
31/8 Moo 13, Tambon Raikhing,
Amphur Sampran, Nakhonpathom 73210 Thailand.

Environment Condition:

Temperature:	22 °C	±	1.9 °C
Humidity:	72 %RH	±	6.2 %RH
Voltage:	229 VAC	±	3.1 VAC

Calibration Place: C.E.M Technology (Thailand) Co., Ltd. (Laboratory Room)
219/43 Moo 12 Petchkasem Road,
Omnoi Krathum Baen, Samut Sakhon 74130 Thailand

Calibration By: Mr. Suphanimit Khamnonphoem

Calibration Date: 15 February 2023

The Method used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C10220016



(Mr. Suphanimit Khamnonphoem)

Person in charge



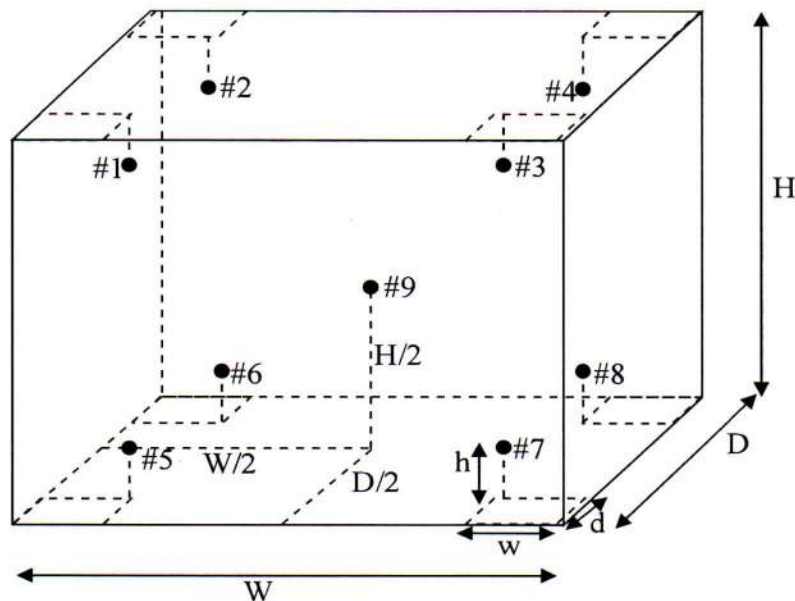
(Mr. Udon Srichana)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.



Standard Installation Locations

Volume (Calibration Zone)= 125 (Liters)

Inside chamber: $W = 65 \text{ (cm)}$ $D = 49 \text{ (cm)}$ $H = 79 \text{ (cm)}$

Standard Locations (#1, #2, #3, #4): $w = 7 \text{ (cm)}$ $d = 5 \text{ (cm)}$ $h = 8 \text{ (cm)}$

Standard Locations (#5, #6, #7, #8): $w = 7 \text{ (cm)}$ $d = 5 \text{ (cm)}$ $h = 8 \text{ (cm)}$

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	1	2	3	4	5	6	7	8	9

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

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

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

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

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

Calibration Results:

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	20.20	0.20	0.34
#2	20.07	0.07	0.37
#3	20.02	0.02	0.36
#4	19.96	-0.04	0.41
#5	20.07	0.07	0.35
#6	20.10	0.10	0.33
#7	19.84	-0.16	0.37
#8	20.08	0.08	0.36
#9	20.09	0.09	0.34

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
20.0	20.0	20.0	20.20	20.07	20.02	19.96	20.07	20.10	19.84	20.08	20.09	0.41

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
20.0	0.30	0.27	0.80

Note: * Maximum uncertainty of the each position

The End of Certificate

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :** ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA.
- ☒ Choice B Non-binary statement with guard band ($w = 1 U$), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.
- ☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r U$) .
; PFA – Probability of False Accept



(Mr. Udon Srichana)

Authorized signatory

Without adjustment

Desired Temperature : 20.0°C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 20.0 °C

Locations	Measured (°C)	Correction of UUC. (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	20.20	0.20	0.34	1.0	Pass
#2	20.07	0.07	0.37	1.0	Pass
#3	20.02	0.02	0.36	1.0	Pass
#4	19.96	-0.04	0.41	1.0	Pass
#5	20.07	0.07	0.35	1.0	Pass
#6	20.10	0.10	0.33	1.0	Pass
#7	19.84	-0.16	0.37	1.0	Pass
#8	20.08	0.08	0.36	1.0	Pass
#9	20.09	0.09	0.34	1.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

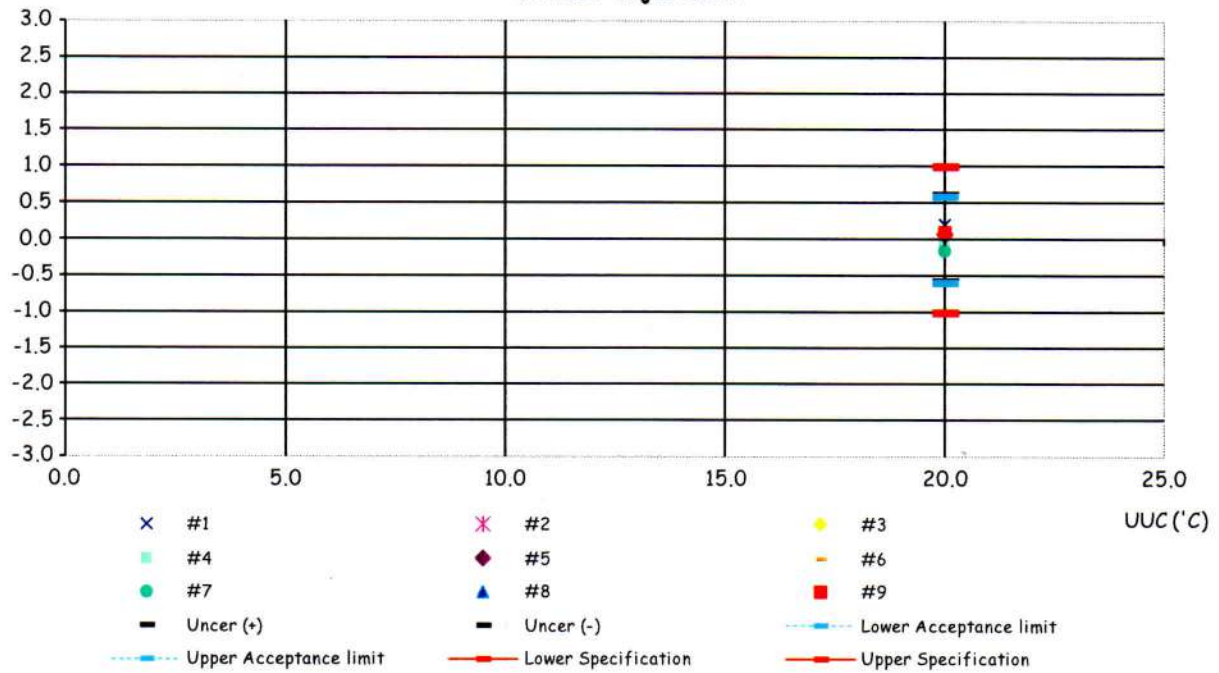
The End of Statements of Conformity

Corr_Distribution & Max_Measurement Uncertainty

Job_No. KSPR2302594

Without adjustment

Correction ('C)

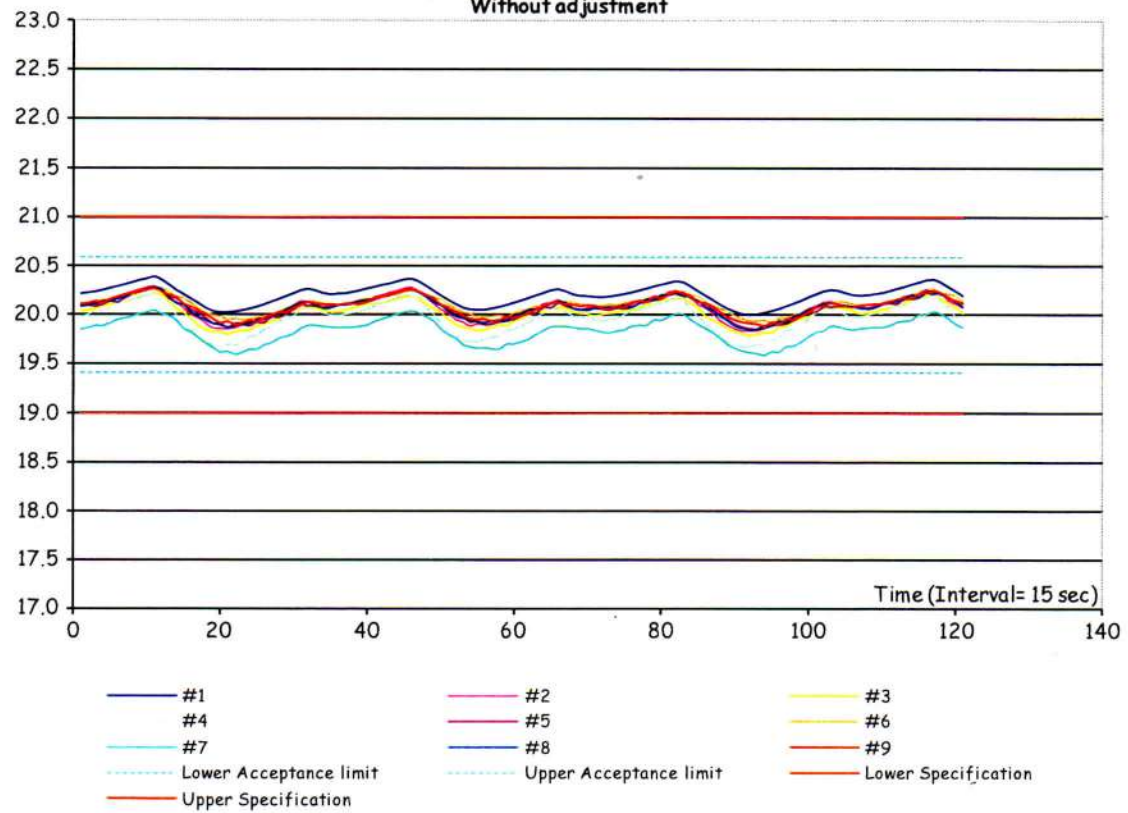


Temperature Distribution @ 20.0°C

Job_No. KSPR2302594

Without adjustment

Std('C)



ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2302594

ชนิดเครื่องมือ: Cooled Incubator

รุ่น: KB 240

หมายเลขเครื่อง: 20180000012164 (WW-16-001)

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
15 Feb 2023			15 Feb 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Suphanimit Khamnonphoem

Service Engineer



Certificate of Calibration

Equipment:	Hot Air Oven	Certificate No.:	C31230315
Model:	UF 55	Issued Date:	16 February 2023
Serial No.(or ID):	B219.0142 (WW-05-002)	Job No.:	KSPR2302593
Manufacturer:	Memmert	Page:	1 of 4
Condition:	In Condition	Ventilation Valve:	Closed
Shelves(pc.):	2		

Customer: C.E.M Technology (Thailand) Co., Ltd.
31/8 Moo 13, Tambon Raikhang,
Amphur Sampran, Nakhonpathom 73210 Thailand.

Environment Condition:

Temperature:	26 °C	±	1.2 °C
Humidity:	55 %RH	±	5.4 %RH
Voltage:	226 VAC	±	2.6 VAC

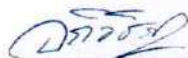
Calibration Place: C.E.M Technology (Thailand) Co., Ltd. (Laboratory Room)
219/43 Moo 12 Petchkasam Road,
Omnoi Krathum Baen, Samut Sakhon 74130 Thailand

Calibration By: Mr. Apiwit Chaosap

Calibration Date: 15 February 2023

The Method used: In house method, CAL-WI-16, base on TLAS-G20

Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through SPC RT Co., Ltd. Certificate No. C10220016



(Mr. Apiwit Chaosap)

Person in charge



(Mr. Udon Srichana)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

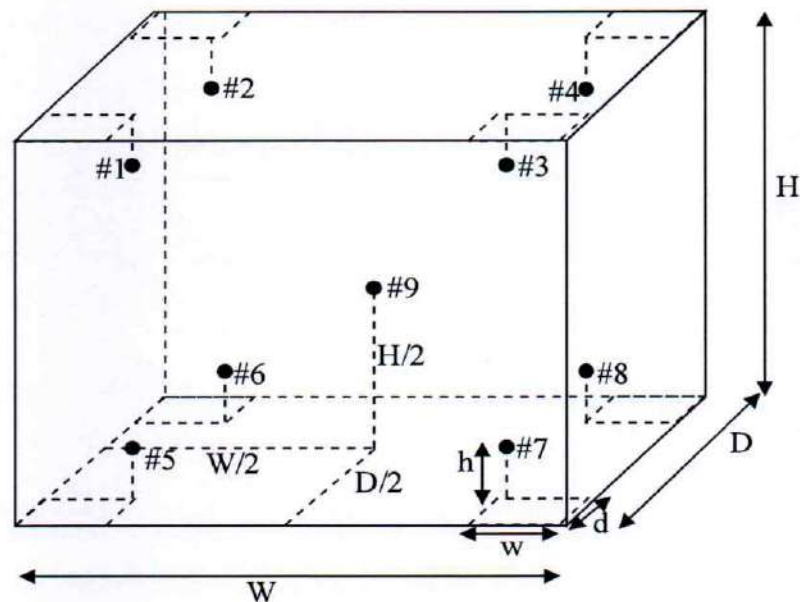
บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด

DKSH Technology Limited

2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260

2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand



Standard Installation Locations

Volume (Calibration Zone)= 21 (Liters)

Inside chamber: $W = 40$ (cm) $D = 33$ (cm) $H = 40$ (cm)

Standard Locations (#1, #2, #3, #4): $w = 5$ (cm) $d = 5$ (cm) $h = 5$ (cm)

Standard Locations (#5, #6, #7, #8): $w = 5$ (cm) $d = 5$ (cm) $h = 5$ (cm)

#9: Geometric center of the chamber

Position of Std	#1	#2	#3	#4	#5	#6	#7	#8	#9
Channel of Logger	1	2	3	4	5	6	7	8	9

Definitions

Indicating Temperature: The average reading of indicating device which forms the integral part of the enclosure.

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

Measured Uniformity: The maximum difference of measured temperatures between of any probes and the measured temperature at the reference location which are observed at same time or at close observation time as possible to determine the temperature pattern or homogeneity with the chamber at steady-state. The reference probe is preferably located in the geometric center of the chamber.

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

Overall Variation: The difference of maximum and minimum measured temperatures throughout observation time.

Calibration Results:

Without adjustment

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	104.08	0.08	0.39
#2	103.99	-0.01	0.39
#3	104.30	0.30	0.39
#4	104.24	0.24	0.39
#5	104.33	0.33	0.39
#6	104.22	0.22	0.39
#7	103.71	-0.29	0.39
#8	104.24	0.24	0.39
#9	104.36	0.36	0.39

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
104.0	104.0	104.0	104.08	103.99	104.30	104.24	104.33	104.22	103.71	104.24	104.36	0.39

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
104.0	0.70	0.07	0.76

Note: * Maximum uncertainty of the each position

Without adjustment (Cont.)

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured Temperature (°C)	Correction of UUC. (°C)	Uncertainty (± °C)
#1	179.63	-0.37	0.46
#2	179.69	-0.31	0.45
#3	180.34	0.34	0.45
#4	180.23	0.23	0.45
#5	180.59	0.59	0.45
#6	180.23	0.23	0.45
#7	179.42	-0.58	0.48
#8	180.28	0.28	0.45
#9	180.67	0.67	0.46

Temperature Distribution

Desired (°C)	Setting (°C)	Indicating (°C)	Measured Temperature at Spread Locations (°C)									Uncertainty (± °C)*
			#1	#2	#3	#4	#5	#6	#7	#8	#9	
180.0	180.0	180.0	179.63	179.69	180.34	180.23	180.59	180.23	179.42	180.28	180.67	0.48

Chamber Characterization

Indicating (°C)	Measured Uniformity (°C)	Measured Stability (± °C)	Overall Variation (°C)
180.0	1.41	0.15	1.54

Note: * Maximum uncertainty of the each position

The End of Certificate

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The correction of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, TLAS-G20. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :** ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA.
- ☒ Choice B Non-binary statement with guard band ($w = 1 U$), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.
- ☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r U$) .
; PFA – Probability of False Accept



(Mr. Udon Srichana)
Authorized signatory

Without adjustment

Desired Temperature : 104.0°C Tolerances : 1.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 104.0 °C

Locations	Measured (°C)	Correction of UUC. (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	104.08	0.08	0.39	1.0	Pass
#2	103.99	-0.01	0.39	1.0	Pass
#3	104.30	0.30	0.39	1.0	Pass
#4	104.24	0.24	0.39	1.0	Pass
#5	104.33	0.33	0.39	1.0	Pass
#6	104.22	0.22	0.39	1.0	Pass
#7	103.71	-0.29	0.39	1.0	Pass
#8	104.24	0.24	0.39	1.0	Pass
#9	104.36	0.36	0.39	1.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

Statements of conformity:(Cont.)
Without adjustment (Cont.)

Desired Temperature : 180.0°C Tolerances : 2.0 °C

Measurement Temperature at Spread Locations, Indicating of Unit Under Calibration: 180.0 °C

Locations	Measured (°C)	Correction of UUC.* (°C)	Guard band (W) (± °C)	Tolerance (± °C)	Conformity
#1	179.63	-0.37	0.46	2.0	Pass
#2	179.69	-0.31	0.45	2.0	Pass
#3	180.34	0.34	0.45	2.0	Pass
#4	180.23	0.23	0.45	2.0	Pass
#5	180.59	0.59	0.45	2.0	Pass
#6	180.23	0.23	0.45	2.0	Pass
#7	179.42	-0.58	0.48	2.0	Pass
#8	180.28	0.28	0.45	2.0	Pass
#9	180.67	0.67	0.46	2.0	Pass

Correction of UUC.* = Measured Temperature - Desired Temperature

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

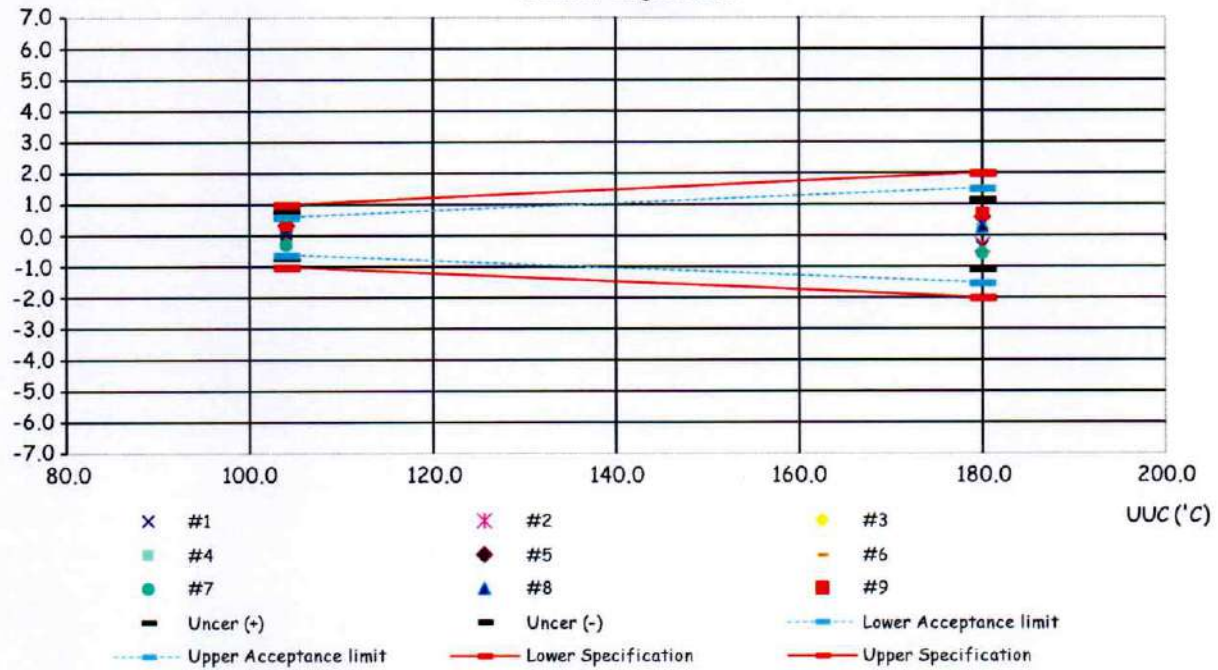
The End of Statements of Conformity

Corr_Distribution & Max_Measurement Uncertainty

Job_No. KSPR2302593

Without adjustment

Correction ('C)

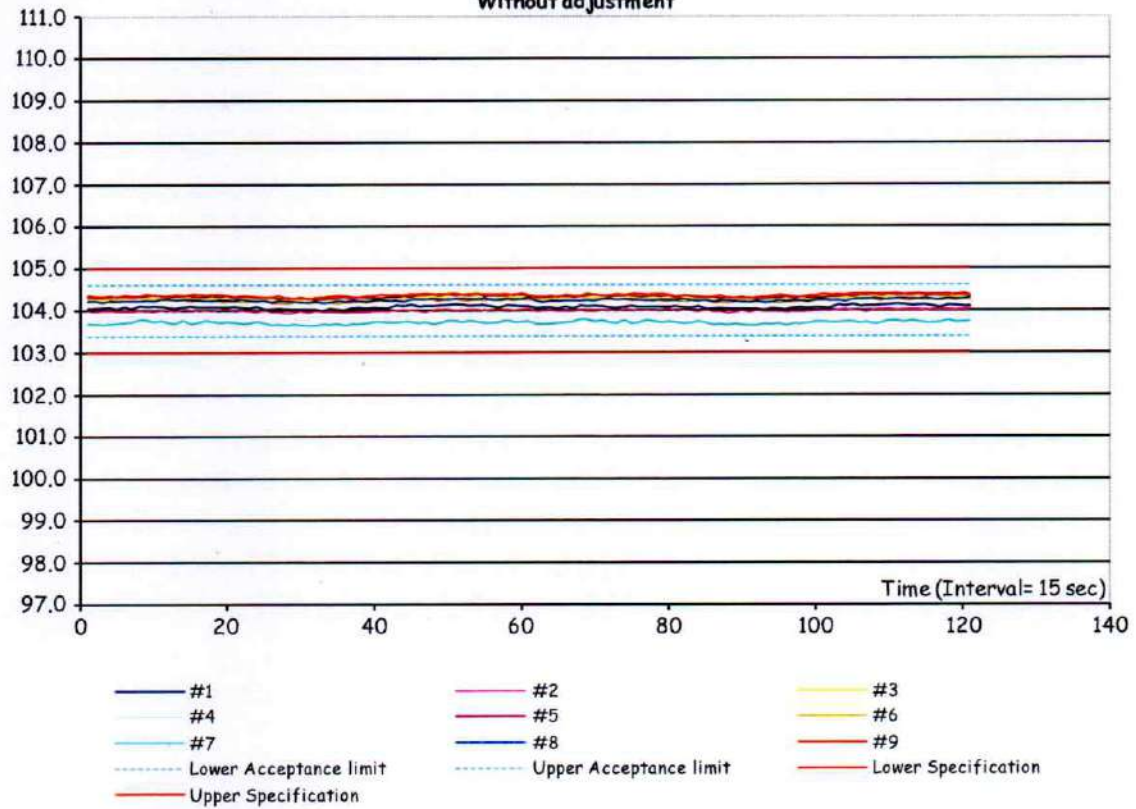


Temperature Distribution @ 104.0°C

Job_No. KSPR2302593

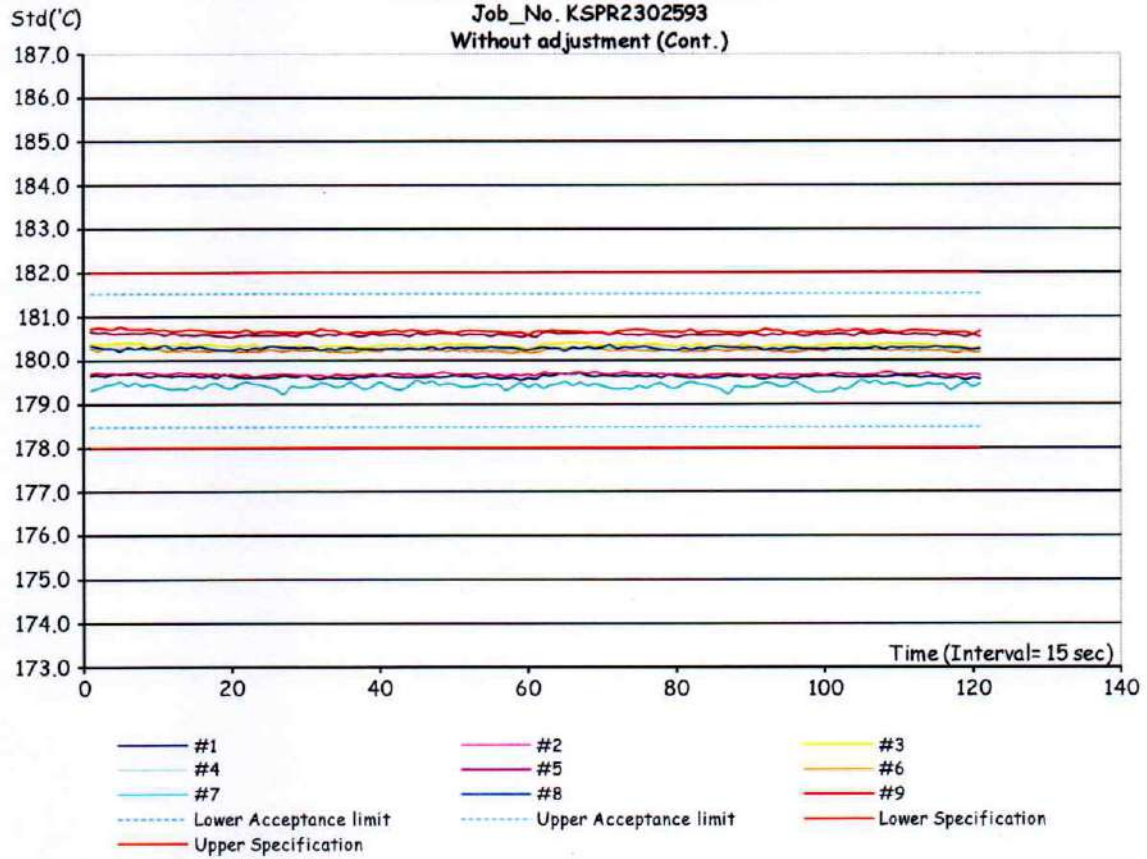
Without adjustment

Std('C)



Temperature Distribution @ 180.0°C

Job_No. KSPR2302593
Without adjustment (Cont.)



ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2302593

ชนิดเครื่องมือ: Hot Air Oven

รุ่น: UF 55

หมายเลขเครื่อง: B219.0142 (WW-05-002)

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
15 Feb 2023			15 Feb 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การทำงาน พัดลม	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. สภาพ Lever of Ventilation valve	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพ Lever door open / close	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Door seal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของระบบ Safety	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	10. การทำงานของระบบทำความเย็น	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	11. การทำงานของระบบทำความร้อน	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	12. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	13. สภาพแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Apiwit Chaosap

Service Engineer

Certificate of Calibration

Certificate No. : 66-420017-1

Page : 1 of 2

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

219/43 Moo.12 Petchkasem Rd, Omnoi, Krathumban, Samutsakorn 74130 (Head Office)

Equipment : pH Meter with electrode

pH meter

Manufacturer : Thermo Scientific Model : VERSA STAR PRO

Range : N/A pH Resolution : 0.01 pH

Serial No. : 12260 ID No. : WW-03-001

Electrode

Model : 9156BNWP Serial No. : VV1-15843

Environment : On site calibration was carried out at the Laboratory C.E.M Technology (Thailand) Co.,Ltd.

Ambient Temperature : (22.0 to 22.6)° C

Relative Humidity : (55 to 58) %

Date of Received : 13 February 2023

Date of Calibration : 13 February 2023

Date of Issue : 18 February 2023

Calibrated by : Bunjerd Masri

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


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

1. Multiproduct Calibrator

ID No.	Cert. No.	Due Date	Traceability
400005	SG-E-00473/64	27 Aug 2023	National Institute of Metrology Thailand (NIMT)

2. Standard Buffer Solution

pH	Cert. No.	Lot No.	Exp. Date	Traceability
4.008	61235182	857394	11 Dec 2024	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
6.986	61267169	857395	11 Dec 2023	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
10.010	61260481	857396	11 Dec 2023	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by : 
(Bunjerd Masri)
Supervisor

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co.,Ltd.



Certificate of Calibration

Certificate No. : 66-420017-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Electrical measurement

pH meter

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

Adjustment Curve at nominal pH	Applied Voltage (mV)	Nominal Value (pH)	UUC Reading		Correction (mV)	Uncertainty (± mV)
			(pH)	(mV)		
4, 7, 10	177.4800	4	4.00	177.4	0.1	0.12
	0.0000	7	7.00	0.0	0.0	0.086
	-177.4800	10	10.00	-177.4	-0.1	0.12

Function : pH meter with electrode

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

Adjustment Curve at nominal pH	Standard Buffer (pH)	UUC Reading (pH)	Correction (pH)	Uncertainty (± pH)
4, 7, 10	4.008	4.01	0.00	0.0097
	6.986	7.00	-0.01	0.011
	10.010	10.01	0.00	0.014

Remark

UUC : Unit Under Calibration

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

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

- o()o -




Certificate of Calibration

Certificate No. : 66-400084-1

Page : 1 of 2

Submitted by : C.E.M Technology (Thailand) Co.,Ltd.
219/43 Moo.12 Petchkasem Rd, Omnoi, Krathumban, Samutsakorn 74130 (Head Office)

Equipment : Digital Thermometer with Thermistor probe
Temperature Indicator

Manufacturer : Thermo Scientific Model : VERSA STAR PRO

Range : N/A °C Resolution : 0.1 °C

Serial No. : 12260 ID No. : WW-03-001

Thermistor probe

Model : N/A Sheath Material : Stainless

Diameter : 6.5 mm. Length : 120 mm.

Serial No. : PT1-18812 ID No. : WW-03-001

Environment : On site calibration was carried out at the Laboratory C.E.M Technology (Thailand) Co.,Ltd

Ambient Temperature : (22.0 to 22.6) °C

Relative Humidity : (55 to 58) %

Line Voltage : (224.5 to 226.0) VAC

Date of Received : 13 February 2023

Date of Calibration : 13 February 2023

Date of Issue : 18 February 2023

Calibrated by : Bunjerd Masri

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4003 by compared with PRT in the dry-well calibrator at the constant controlled temperature.

The temperature scale used was based on ITS-90


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

1. Platinum Resistance Thermometer (PRT)

ID No.	Cert. No.	Due Date	Traceability
400002	TT-0074-22	20 Jun 2024	National Institute of Metrology Thailand (NIMT)

2. Standard Digital Thermometer

ID No.	Cert. No.	Due Date	Traceability
400033	22E569	22 Feb 2024	National Institute of Metrology Thailand (NIMT)

Approved by : 
(Bunjerd Masri)
Supervisor



Certificate of Calibration

Certificate No. : 66-400084-1

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Function : Temperature measurement

Immersion Depth (mm.)	Standard Reading (° C)	UUC Reading (° C)	Correction (° C)	Uncertainty (± ° C)
120	25.004	25.0	0.0	0.19

Remark

UUC : Unit Under Calibration

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

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

- o0o -

B.





Bangkok High Lab Co.,Ltd.

4/176 Soi Ladplakao 66, Ladplakao Rd., Anusawari, Bangkhen, Bangkok 10220

Tel: (662) 971-5800

Website: www.bangkokhighlab.com

Fax: (662) 971-5300

E-mail: info@bangkokhighlab.com



NSC-TISI-TIS 17025
CALIBRATION 0366

CERTIFICATE OF CALIBRATION

Certificate No : S2022/168

Page : 1/5

Order No : 316/2022

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

Address : 219/43 Moo 12 Phet Kasem Rd., Omnoi, Krathum Baen, Chachoengsao 24000

Instrument : UV/VIS spectrophotometer

Manufacture : MERCK

Model : Prove100

Serial Number : 1714112078

Environment : Temperature (26.6 - 26.4) °C

: Humidity (58 - 60) %RH

Received Date : September 29, 2022

Calibration Date : September 29, 2022

Issued Date : October 3, 2022

Calibrate Status : No Adjustment

Calibration Area : Customer area

Roomname : Laboratory Room of C.E.M Technology (Thailand) Co., Ltd

Calibrated By : JEERAPAT
(Mr.Jeerapat Thaepphaisun)
Calibration Engineer

Approved By : [Signature]
(Mr.Wanchai Meesiri)
Manager



Bangkok High Lab Co.,Ltd.

4/176 Soi Ladplakao 66, Ladplakao Rd., Anusawari, Bangkok, Bangkok 10220

Tel: (662) 971-5800

Fax: (662) 971-5300

Website: www.bangkokhighlab.com

E-mail: info@bangkokhighlab.com



Certificate No : S2022/168

Page : 2/5

1. Photometric Accuracy

CRMs: Neutral Density Glass Filters

CRMs Serial Number: A404

Traceability: Traceable to NIST, U.S.A. through Neutral density filters NIST SRM 930e & 1930, Double Aperture method through Starna certificate report no. 108644

Spectral slit width : 4.00 nm

1.1 Reading scale at 420.0 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4965	0.495	0.0015	0.0044
0.9630	0.960	0.0030	0.0038
2.0356	2.030	0.0056	0.0064

1.2 Reading scale at 440.0 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4870	0.485	0.0020	0.0040
0.9433	0.942	0.0013	0.0040
1.9665	1.970	-0.0035	0.0064

1.3 Reading scale at 465.0 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4535	0.454	-0.0005	0.0034
0.8780	0.879	-0.0010	0.0040
1.8424	1.840	0.0024	0.0060

1.4 Reading scale at 546.1 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4706	0.469	0.0016	0.0028
0.9094	0.909	0.0004	0.0028
1.8755	1.875	0.0005	0.0064



Bangkok High Lab Co.,Ltd.

4/176 Soi Ladplakao 66, Ladplakao Rd., Anusawari, Bangkok, Bangkok 10220

Tel: (662) 971-5800

Fax: (662) 971-5300

Website: www.bangkokhighlab.com

E-mail: info@bangkokhighlab.com



Certificate No : S2022/168

Page : 3/5

1.5 Reading scale at 590.0 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4887	0.489	-0.0003	0.0029
0.9464	0.945	0.0014	0.0029
1.9021	1.899	0.0031	0.0061

1.6 Reading scale at 635.0 nm

Filter STDs (Abs) Certificate	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
0.0000	0.000	0.0000	0.0028
0.4634	0.463	0.0004	0.0030
0.8992	0.896	0.0032	0.0031
1.7824	1.776	0.0064	0.0062

2. Photometric Accuracy

CRMs: Potassium Dichromate in Perchloric acid

CRMs Serial Number: 15086

Blank Serial Number: 15178

Traceability: Traceable to NIST, U.S.A. through crystalline potassium dichromate NIST SRM 935a through Starna certificate report no. 88921

Spectral slit width : 4.00 nm

Wavelength (nm)	Certificate (Abs)	Average Measured Value (A)	Correction (A)	Uncertainty ± (A)
235	0.0000	#N/A	#N/A	#N/A
	0.7340	#N/A	#N/A	#N/A
257	0.0000	#N/A	#N/A	#N/A
	0.8528	#N/A	#N/A	#N/A
313	0.0000	#N/A	#N/A	#N/A
	0.2873	#N/A	#N/A	#N/A
350	0.0000	#N/A	#N/A	#N/A
	0.6336	#N/A	#N/A	#N/A



Bangkok High Lab Co.,Ltd.

4/176 Soi Ladplakao 66, Ladplakao Rd., Anusawari, Bangkhen, Bangkok 10220

Tel: (662) 971-5800

Fax: (662) 971-5300

Website: www.bangkokhighlab.com

E-mail: info@bangkokhighlab.com



NSC-TISI-TIS 17025
CALIBRATION 0366

Certificate No : S2022/168

Page : 4/5

3. Wavelength Accuracy

Spectral slit width : 4.00 nm

3.1 CRMs: Holmium Glass Filter

CRMs Serial Number: W184/H

Traceability: Traceable to NIST Holmium oxide filter NIST SRM 2034, through Starna certificate report no. 108651

Filter STDs (nm) Certificate	Average Measured Value (nm)	Correction (nm)	Uncertainty ± (nm)
241.74	#N/A	#N/A	#N/A
279.44	#N/A	#N/A	#N/A
287.98	#N/A	#N/A	#N/A
334.10	333.3	0.80	0.12
361.00	360.2	0.80	0.12
418.61	418.2	0.41	0.12
453.63	452.6	1.03	0.12
460.05	459.4	0.65	0.12
536.66	536.0	0.66	0.12
637.98	637.4	0.58	0.12

3.2 CRMs: Didymium Glass Filter

CRMs Serial Number: W184/D

Traceability: Traceable to NIST Holmium oxide filter NIST SRM 2034, through Starna certificate report no. 108652

Filter STDs (nm) Certificate	Average Measured Value (nm)	Correction (nm)	Uncertainty ± (nm)
585.29	584.8	0.49	0.12
684.49	683.6	0.89	0.12
740.18	739.2	0.98	0.12
748.48	747.4	1.08	0.12
807.03	806.1	0.93	0.12
879.27	878.5	0.77	0.12



Bangkok High Lab Co.,Ltd.

4/176 Soi Ladplakao 66, Ladplakao Rd., Anusawari, Bangkok, Bangkok 10220

Tel: (662) 971-5800

Fax: (662) 971-5300

Website: www.bangkokhighlab.com

E-mail: info@bangkokhighlab.com



NSC-TISI-TIS 17025
CALIBRATION 0366

Certificate No : S2022/168

Page : 5/5

4. *Stray Light

CRMs: Potassium Chloride aqueous solution

CRMs Serial Number: 5469

Blank Serial Number: 8745

Traceability: Traceable to NIST, U.S.A. potassium chloride NIST SRM2032, through Starna certificate report no. 88922

Spectral slit width : 4.00 nm

Wavelength (nm)	Certificate	Average Measured
201.28	>2A	#N/A
201.28	<1%T	#N/A

5. *Spectral Resolution

CRMs: Toluene in Hexane

CRMs Serial Number: 8697

Blank Serial Number: 8716

Traceability: Traceable to toluene in hexane NIST SRM2034, through Starna certificate report no. 88923

Spectral slit width (nm)	Abs Ratio
0.5	#N/A
1.0	#N/A
1.5	#N/A
2.0	#N/A
3.0	#N/A

Note : * "Not TISI Accredited" in this certificate have been included for completeness

Remark: Calibrate Method

- 1.1 Photometric and Wavelength accuracy: In-house method W-SER-001 based on ASTM E925-02 and ASTM E275-01
- 1.2 Stray light: Measuring the CRMs in both absorbance and transmittance unit at wavelength 201.23 nm. Base on European Pharmacopoeia V.6.19.3 1984
- 1.3 Spectral resolution: Measuring the CRMs. The maximum absorbance values were read at closest to 268.7nm and the minimum absorbance values were read at closest 267.0 nm. Refer to European Pharmacopoeia V.6.19.3 1984
2. N/A = not available.
3. Uncertainty of Measurement: The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.
4. This result of calibration was found accurate as shown on date and place of calibration only.
5. This report will certify of calibrated equipment only.

- End of Report -



Certificate of Calibration

Equipment:	Digital Thermometer with Sensor	Certificate No.:	C15230305
Model:	TK 61	Issued Date:	16 February 2023
Serial No.:	1P181269184	Job No.:	KSPR2302595
Manufacturer:	KIMO	ID No.:	WW-06-002
Condition:	In Condition	Page:	1 of 2

Customer: C.E.M Technology (Thailand) Co., Ltd.
31/8 Moo 13, Tambon Raikhing,
Amphur Sampran, Nakhonpathom 73210 Thailand.

Environment Condition: Temperature: 22 °C ± 3 °C
Humidity: 50 %RH ± 20 %RH
Voltage: 220 VAC ± 10 %

Calibration Place: Thermo-Hygro Laboratory, DKSH Technology Limited.
2533 Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260 Thailand

Calibration By: Mr. Anat Karapitak
Calibration Date: 16 February 2023
The Method used: In house method, CAL-WI-19, by comparison with standard thermometer
Traceability: This certificate is traceable to the International System of Unit maintained by National Institute of Metrology Thailand Certificate No. TT-0111-21



(Mr. Anat Karapitak)
Person in charge



(Mr. Pramote Ramrong)
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.

The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor ($k=2$) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).

These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

Calibration Results:
Without Adjustment

Sensor Type: TC Type K

Channel: T1

Diameter (mm): 2

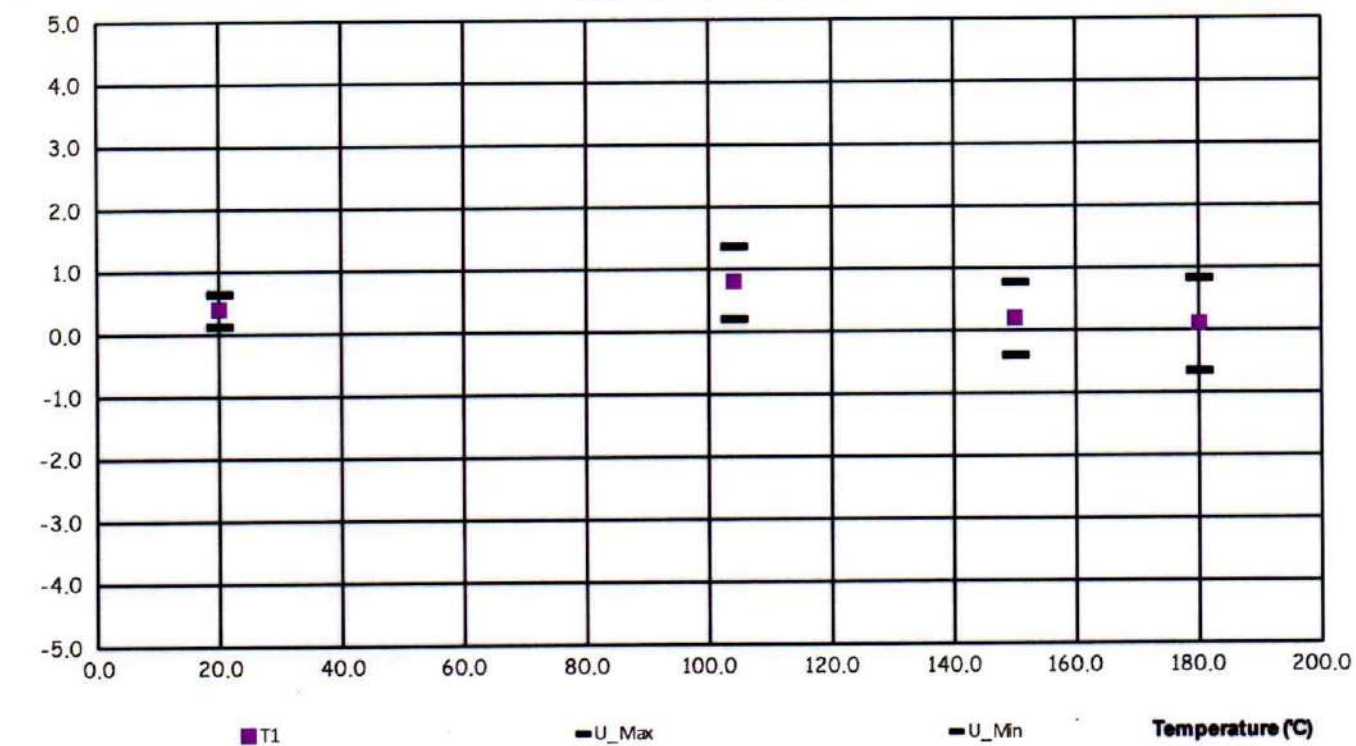
Length (mm): -

Immersion (mm): 110

Calibrate Point.(°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)
20.0	20.0021	19.6	0.4021	0.26
104.0	104.0036	103.2	0.8036	0.58
150.0	150.0018	149.8	0.2018	0.58
180.0	180.0039	179.9	0.1039	0.74

The End of Certificate

Without Adjustment
Job No.: KSPR2302595



ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ

เลขที่ใบงาน: KSPR2302595

ชนิดเครื่องมือ: Digital Thermometer with Sensor

รุ่น: TK 61

หมายเลขเครื่อง: 1P181269184

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
16-Feb-2023			16-Feb-2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input type="checkbox"/>	<input type="checkbox"/>	2. Adapter / Power supply 220 / 110 VAC	<input type="checkbox"/>	<input type="checkbox"/>	ไม่มี
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. การทำงาน Main Switch	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การทำงาน Selector Key	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การแสดงผล Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. Battery	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. สภาพตัวเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. สภาพ Sensor (In / Ex)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

ข้อแนะนำ :

Mr. Anat Karapitak

Service Engineer

CERTIFICATE OF CALIBRATION

Certificate No.: T1-2103001/23

Page 1 **of total** 4 **pages**

Customer C.E.M TECHNOLOGY (THAILAND) CO., LTD.
219/43 Moo 12, Petchkasem Road, Omnoi,
Krathumban, Samutsakorn 74130

Equipment Thermo Reactor

Manufacturer Merck

Model TR420

Serial No. 19490640

ID No. WW-07-002

Description Resolution of UUC : 1 °C

Environmental Conditions Ambient Temperature: 24.5 °C
Relative Humidity: 41 %
Atmospheric Pressure: -

Calibration Location Laboratory

Received Date 21 March 2023

Calibration Date 21 March 2023

Date of Issue 22 March 2023

Condition of Artifacts Used conditions but can be calibrated

Checked by



Act as Technical Manager

Approved by



Representative of Managing Director

<input type="checkbox"/> (Krisyosl K.)	<input type="checkbox"/> (Sakda Y.)
<input type="checkbox"/> (Patiphan K.)	<input type="checkbox"/> (Onnapa P.)
<input checked="" type="checkbox"/> (Pongsak H.)	<input type="checkbox"/> (Nitiphong K.)
<input type="checkbox"/> (Kanung C.)	<input type="checkbox"/> (Nonthachai K.)
<input type="checkbox"/> (Pramong P.)	<input type="checkbox"/> (Noppol P.)

(Dr. Ekachai Puttitwong)

Certificate No.: T1-2103001/23

Page 2 of total 4 pages

Reference Method :

- The calibration method used was CP-142 based on an in-house method.
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Data Logger with Sensors	34972A/ 34901A	MY57010717/ MY59004982	I0-1308001/22	Aug. 12, 2023	THC

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- THC, Thai Heart Calibration Co., Ltd.

Certificate No.: T1-2103001/23

Page 3 of total 4 pages
Measurement Results:
(L)

Hole No.	UUC Setting (°C)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Stability of UUC (± °C)	Uncertainty (± °C)
# 1	150	148.1	150	-1.9	0.16	0.61
# 2	150	148.1	150	-1.9	0.15	
# 3	150	147.8	150	-2.2	0.11	
# 4	150	147.8	150	-2.2	0.18	
# 5	150	148.7	150	-1.3	0.13	
# 6	150	148.5	150	-1.5	0.21	
# 7	150	148.6	150	-1.4	0.14	
# 8	150	149.5	150	-0.5	0.18	
# 9	150	148.5	150	-1.5	0.13	
# 10	150	149.0	150	-1.0	0.15	
# 11	150	149.5	150	-0.5	0.24	
# 12	150	148.7	150	-1.3	0.15	

(R)

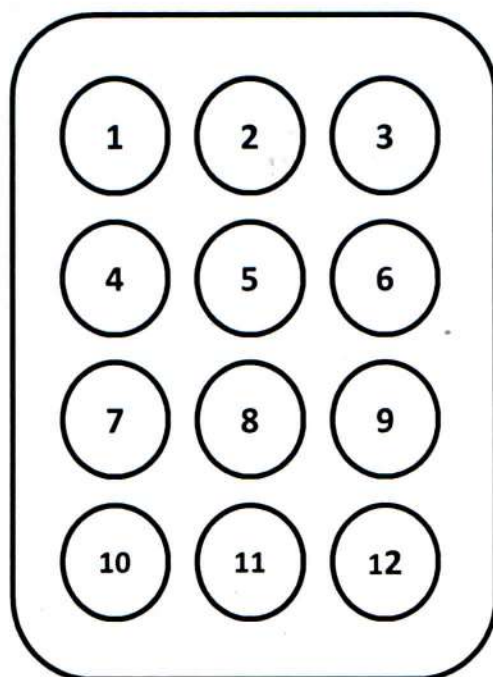
Hole No.	UUC Setting (°C)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Stability of UUC (± °C)	Uncertainty (± °C)
# 1	150	148.2	150	-1.8	0.12	0.61
# 2	150	148.0	150	-2.0	0.13	
# 3	150	148.5	150	-1.5	0.21	
# 4	150	149.0	150	-1.0	0.18	
# 5	150	149.6	150	-0.4	0.16	
# 6	150	149.3	150	-0.7	0.15	
# 7	150	148.4	150	-1.6	0.18	
# 8	150	148.6	150	-1.4	0.15	
# 9	150	148.4	150	-1.6	0.16	
# 10	150	148.6	150	-1.4	0.12	
# 11	150	149.2	150	-0.8	0.12	
# 12	150	148.5	150	-1.5	0.12	

UUC : Unit Under Calibration
Calibrated by
Apisit

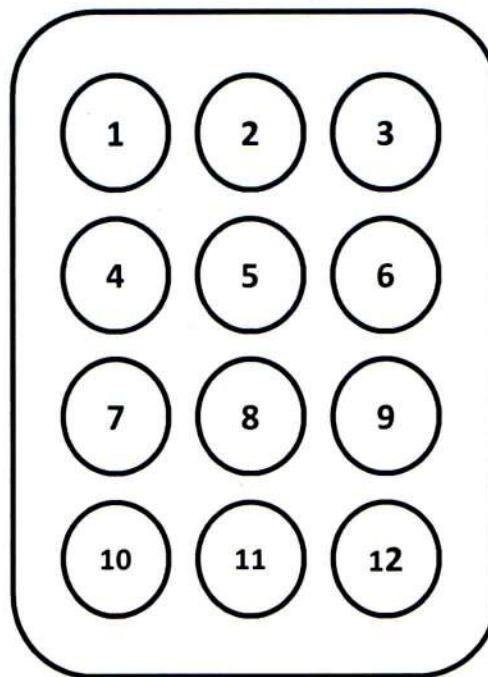
Certificate No.: T1-2103001/23

Page 4 of total 4 pages

Measurement Results (Cont.):



Front View L



Front View R

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

- End of Certificate -

Certificate of Calibration

Certificate No. : 66-430007-1 **Page : 1 of 2**

Submitted by : C.E.M Technology (Thailand) Co.,Ltd.
219/43 Moo.12 Petchkasem Rd, Omnoi, Krathumban, Samutsakorn 74130 (Head Office)

Equipment : Digital Conductivity meter (Pocket)
Manufacturer : XS Instruments Model : PC 5
Serial No. : GB 0706/024 ID No. : WW-23-001

Environment : On site calibration was carried out at the Laboratory C.E.M Technology (Thailand) Co.,Ltd.
Ambient Temperature (22.0 to 22.6) °C
Relative Humidity (55 to 58) %

Date of Received : 13 February 2023
Date of Calibration : 13 February 2023
Date of Issue : 18 February 2023
Calibrated by : Bunjerd Masri

Calibration Method : In-house method CAL-M4301 direct measurement by conductivity buffer solution

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

Standard Buffer Solution

Material	Lot No.	Exp. Date	Traceability
84 µS/cm	7824	16 June 2025	National Institute of Standards and Technology (NIST), U.S.A., S.R.M.
1413 µS/cm	795891	17 February 2023	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025
12.88 mS/cm	795893	14 February 2023	CPA Chem Ltd. Accredited to ISO 17034 and ISO/IEC 17025

Approved by :

(Bunjerd Masri)

Supervisor

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full except with the prior written approval of the Calibratech Co.,Ltd.



Certificate of Calibration

Certificate No. : 66-430007-1

Page : 2 of 2

Result of Calibration :

UUC Condition As-Received : Good

Function : Conductivity measurement

Before Adjustment

Standard Conductivity Solution	UUC Reading	Correction	Uncertainty (±)	Unit
84*	116.4	-32.4	1.1	μS/cm
1413	1576	-163	9.0	μS/cm
12.88	15.27	-2.39	0.082	mS/cm

After Adjustment : at 84, 1413 μS/cm 12.880, 80 mS/cm

Standard Conductivity Solution	UUC Reading	Correction	Uncertainty (±)	Unit
84*	84.0	0.0	1.1	μS/cm
1413	1413	0	9.0	μS/cm
12.88	12.88	0.00	0.082	mS/cm

Remark

UUC : Unit Under Calibration

* This parameter are out of accreditation's scope.

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

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

- ๐0๐ -





THAI CALIBRATION SERVICES CO., LTD.

19/8 Moo 9 Soi Raiking 30 Puttamonton 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



CALIBRATION CERTIFICATE

Certificate No.S2303153S

page 1 of 2

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

Equipment : Non-automatic weighing instrument (Electronic instrument)

Manufacturer : Sartorius **Order No. :** 66S0828-1

Model : BSA224S-CW **Ambient temperature :** $(24.1 \pm 5.0) ^\circ\text{C}$

Accuracy class : - **Relative humidity :** $(47.5 \pm 10.0) \%$

Capacity : 220000 mg **Received date :** 03-Mar-2023

Resolution : 0.1 mg **Date of calibration :** 03-Mar-2023

Serial No. : 3139614148 **Date of issue :** 04-Mar-2023

ID No. : CI-01-003 **Condition of the balance :** Good working conditions

Place of calibration : ห้องเครื่องชั่ง

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	1 mg to 2 kg	15885+15849	M2210001S	8-Oct-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 :

Teerawat Intanom
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



CALIBRATION CERTIFICATE

Certificate No.S2303153S

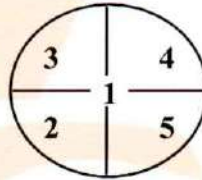
page 2 of 2

The repeatability of indication

Nominal Value (mg)	Standard Deviation of reading (mg)	Maximum difference between successive reading (mg)	n
200000	0.04	0.1	5

The effect of eccentric application of a load on the indication (test load : 100000 mg)

Position	Balance Reading (mg)
Point 1	100000.0
Point 2	99999.9
Point 3	100000.0
Point 4	100000.0
Point 5	100000.0
Eccentric Value	0.1



The error of indication

Nominal Value (mg)	Value of Reference Standard Weight (mg)	Balance Reading (mg)	Correction (mg)	Uncertainty (±) (mg)	k
Unload	0.0	0.0	0.0	0.14	2.21
1000	1000.0	1000.0	0.0	0.14	2.20
2000	2000.0	2000.1	-0.1	0.14	2.20
5000	5000.0	5000.1	-0.1	0.14	2.18
10000	10000.0	10000.0	0.0	0.14	2.17
20000	20000.0	20000.0	0.0	0.15	2.14
50000	50000.0	50000.1	-0.1	0.15	2.11
100000	100000.0	99999.8	+0.2	0.18	2.04
120000	120000.0	119999.8	+0.2	0.22	2.00
150000	150000.0	149999.8	+0.2	0.24	2.00
200000	200000.0	199999.7	+0.3	0.27	2.00

Remark : Adjustment, Internal weight

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--