

ภาคผนวกที่ 4

---

สรุปเอกสารสอบเทียบอุปกรณ์เครื่องมือ

เอกสารการสอบเทียบเครื่องเมื่อตรวจวัดคุณภาพน้ำ

		<b>CERTIFICATE OF CONFORMITY</b>	
<b>Aquion System</b>			
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:	22175-60018	<b>Aquion Final Test</b>	
<input checked="" type="checkbox"/> Pump Calibration, Ripple and Accuracy		<input checked="" type="checkbox"/> Injection Valve Precision	
<input checked="" type="checkbox"/> Suppressor Current, Cal and Accuracy		<input checked="" type="checkbox"/> Relay and TTL I/O Test	
<input checked="" type="checkbox"/> Column Heater, Cal and Check		<input checked="" type="checkbox"/> Injection Valve Functionality	
<input checked="" type="checkbox"/> Detector Heater, Cal and Accuracy		<input checked="" type="checkbox"/> Leak Sensors	
<input checked="" type="checkbox"/> Conductivity Detector Cal, Noise and Linearity		<input checked="" type="checkbox"/> Leak Detection Functionality	
<input checked="" type="checkbox"/> Degass Calibration		<input checked="" type="checkbox"/> Eluent Generator Calibration	
Tester's Signature:	Angel Ruiz	Date:	22 Dec 2022
		60-089566 Rev B	

# Aquion Pump Summary Test Report

Instrument Name	Model	Serial Number	Moduleware
Pump	Aquion	221280114	3.1.0
Detector		221260053	

Sequence Name: 1\_Aquion\_Pump\_FQO  
 Sequence Run Date: 22 Dec 2022  
 Sequence Comment: Aquion Pump Test Final

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

Pressure Ripple Test			
Test Run	Pressure	Measured	Pressure Ripple
Flow Accuracy: 1mL/min	2132	0.080%	<= 0.30%
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
Pump	Aquion	221280114	3.1.0
Detector		221260053	

Sequence Name: 2\_Aquion\_Detector\_FQO  
 Sequence Run Date: 22 Dec 2022  
 Sequence Comment: AQUION Final Test Detector

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

Detector Noise & Drift Test				
Test Run	Background Signal	Measured	Drift	Noise
Cell DI Water Noise and Drift	0.050 $\mu$ S	4.715 nS/hour	<=10.0 nS/hour	<=0.2 nS
	Pass	Pass	Pass	Pass

Detector Linearity Test			
Test Run	Correlation Coefficient	%RSD	Calibration Curve
Cell Linearity Test 5 ppm	Measured >= 0.999	Measured <=5.0 %	Slope
	Pass	Pass	Offset 0.000

Injector Precision Test			
Test Run	Average	%RSD	Retention Time
Injector Precision: 50 ppm	2.576 $\mu$ S*min	0.106%	Average 0.373 min
		Pass	Max-Min 0.0100 min

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	0.000
	Electrical Offset	1.96
	Heater Slope	1.02

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

Detector	Detector Calibration	12/22/2022
	Fine Offset	251260.77
	Fine Slope	0.000000025
	Mid-Range Offset	28004.72
	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>



Harikul Science Co., Ltd.  
694 Soi Ratchadriwit 24, Pacharatbampien,  
Samsaenok, HuaiKhwang, Bangkok 10310  
Tel: 0-2274-2456 Fax: 0-2274-2443  
Email: info@harikul.com www.harikul.com

CERT No.: HS-T0591

Certificate of Calibration

Calibration Date: 1 Sep 22

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

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

Samutsakom 74130

Model : YSI 5000

S/N : 18L109487

: YSI 5010

S/N : 22G100123

ID NO. :

Air Temp ref : S/N. E00522

Barometric ref : S/N. E00522

Water Temp ref : S/N. 11431

Avg Room Temp : 20 °C

Avg Water Temp : 20 °C

Air Pressure : 760.00 mmHg

Salinity : 0 ppt

Technician : Kittipong M.

## Calibration Details

Calibration Point	100% air sat. (@20 °C, DO = 9.09 mg/l)	(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.

*[Signature]*

Technician Signature

*[Signature]*

Laboratory Manager

## 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		Detector	
Left Carrier	-	Right Carrier	Helium, 3.0mL/min
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

Calibration Result

Page 1 of 1



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.



Service Engineer : (Teerapon Tawonwong)

December 21, 2022

Amani Corporation Limited

## 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	9.3	8.0-12.0	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Fail
High	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	9.7	8.0-12.0	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Fail
High	31.3	28.0-32.0	<input checked="" type="checkbox"/> Passed <input type="checkbox"/> Fail

Service Engineer Signature:

(Teerapon Tawonwong)

Date:

21.12.2022

Calibration Result

Page 2 of 1

## 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)

Date:

21.12.2022


Calibration Result

Page 3 of 1

## 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

## Operating Condition

Parameter	Condition
<b>Environmental</b>	Temperature 25.0 °C Relative Humidity 45.7 °C  <b>Gases</b> - Carrier Gas : Helium = 1ml/min - Hydrogen = 35 ml/min - Air = 350 ml/min - Make-up Gas: Nitrogen = 30ml/min  <b>Oven</b> - Initial Temperature = 50°C - Initial Time = 1 minute - Ramp 1 = 20 °C/minute - Final Temperature = 200°C - Final Time = 1 minute
<b>Instrument Condition</b>	<b>Injector</b> - Operating Mode = Split - Temperature = 230 °C - Split Flow 40. ml/min - Purge Flow rate = 5 ml/min  <b>Detector</b> - Base Temperature = 250 °C - Detector Signal Range = 10°  <b>Injected Volume</b> - 1 µl + needle of Test Mixture

Service Engineer Signature:  (Teerapon Tawonwong)

Date: 21.12.2022



## Certificate of Calibration

**Equipment:** Cooled Incubator  
**Model:** KB 240  
**Serial No.(or ID):** 2018000012164 (WW-16-001)  
**Manufacturer:** Binder  
**Condition:** In Condition  
**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

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.

DKSH Technology Limited  
2533 Sukhumvit Road, Bangkok, Prachinburi, 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

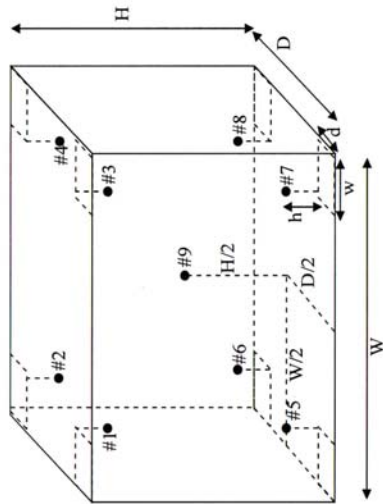
Delivering Growth - in Asia and Beyond.

CAL-FM-C31-10: 12 Sep 2022



Certificate No.: C31230380

Page: 2 of 3



### Standard Installation Locations

Volume (Calibration Zone)= 125 (Liters)

Inside chamber: W = 65 (cm) D = 49 (cm) H = 79 (cm)  
Standard Locations (#1, #2, #3, #4): w = 7 (cm) d = 5 (cm) h = 8 (cm)  
Standard Locations (#5, #6, #7, #8): w = 7 (cm) d = 5 (cm) h = 8 (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.

DKSH Technology Limited  
2533 Sukhumvit Road, Bangkok, Prachinburi, 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C31-10: 12 Sep 2022



### 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 Sirichana)  
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

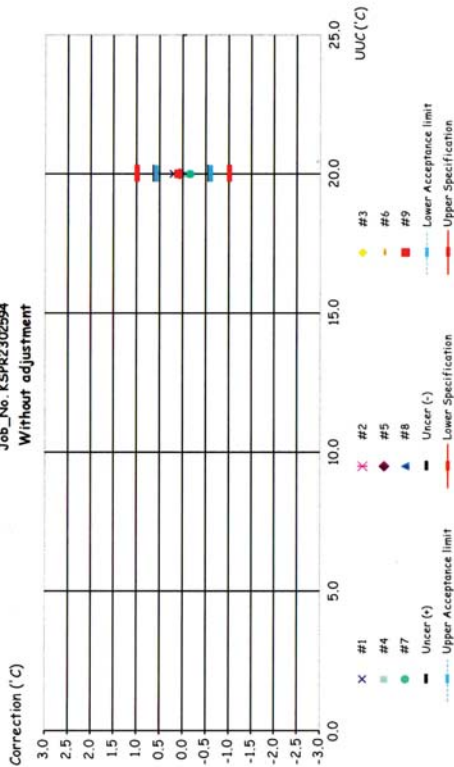
Correction of UUC: \* = Measured Temperature - Desired Temperature

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

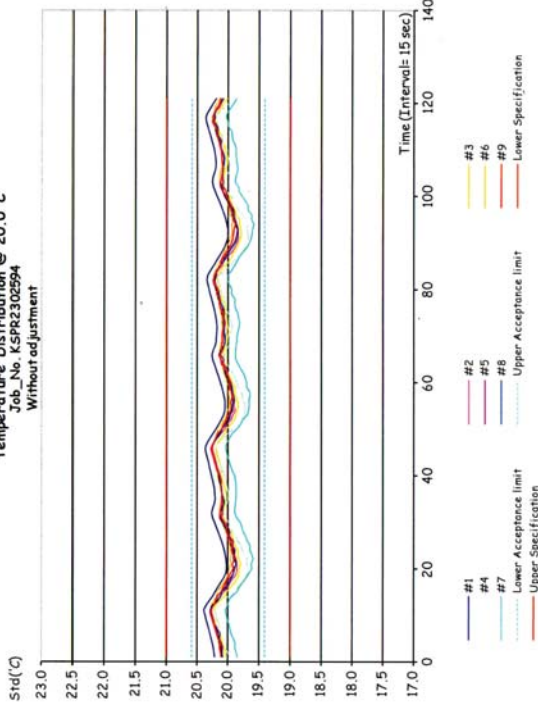
### The End of Statements of Conformity



Corr\_Distribution & Max\_Measurement Uncertainty  
Job\_No. KSPR2302594  
Without adjustment



Temperature Distribution @ 20.0°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	
<b>General</b>					
<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 ฟัดลม	<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"/>	

ขอแนะนำ :

Mr. Suphanimit Khamnonphoom  
Service Engineer

บริษัท ดีเคเอสเอช (ประเทศไทย) จำกัด  
DKSH Technology Limited  
2533 ถนนสุเทพ แขวงจันทบุรี กรุงเทพมหานคร 10260  
2533 Sukhthep Road, Jantaburi, Bangkok 10260  
Phone: +66 2839 7000 Email: info.ccs@dksh.com Website: www.dksh.com/thailand

Delivering Growth - In Asia and Beyond.



## Certificate of Calibration

**Equipment:** Hot Air Oven  
**Model:** UF 55  
**Serial No.(or ID):** B219.0142 ( WW-05-002 )  
**Manufacturer:** Memmert  
**Condition:** In Condition  
**Shelves(pc.):** 2

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

(Mr. Udon Srichana)

Person in charge

Authorized signatory

This certificate is issued in 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.

**DKSH Technology Limited**  
2533 Sukhumvit Road, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

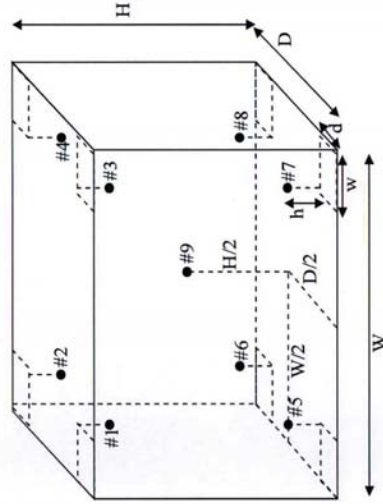
Delivering Growth - in Asia and Beyond.

CAL-FM-C31-10: 12 Sep 2022



Certificate No.: C31230315

Page: 2 of 4



### 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.

**DKSH Technology Limited**  
2533 Sukhumvit Road, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C31-10: 12 Sep 2022

### 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



Refer to Certificate No.: C31230315 Page: 1 of 2

## 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.

DKSH Measurement services Ltd. Co., Ltd.  
DKSH Temperature Calibration Services (Thailand) Co., Ltd.  
2533 Sukhumvit Road, Bangkok, Prachinburi, 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

CAL-FM-C31-10: 12 Sep 2022



Refer to Certificate No.: C31230315 Page: 2 of 2

## 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.

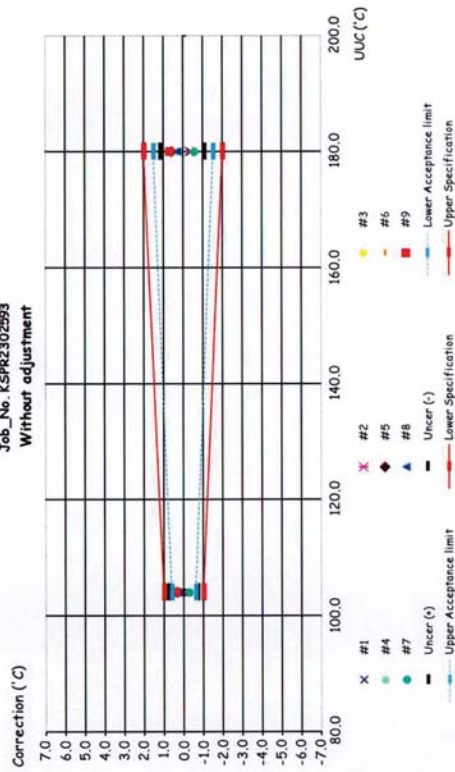
## The End of Statements of Conformity

DKSH Measurement services Ltd. Co., Ltd.  
DKSH Temperature Calibration Services (Thailand) Co., Ltd.  
2533 Sukhumvit Road, Bangkok, Prachinburi, 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

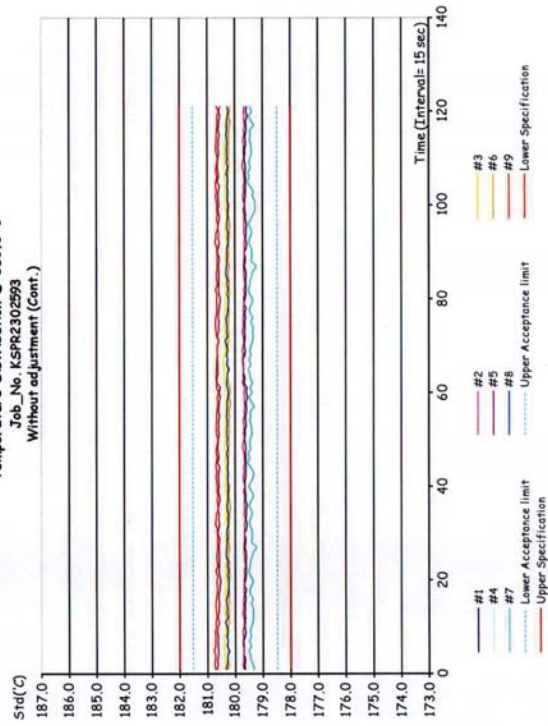
Delivering Growth - in Asia and Beyond.

CAL-FM-C31-10: 12 Sep 2022

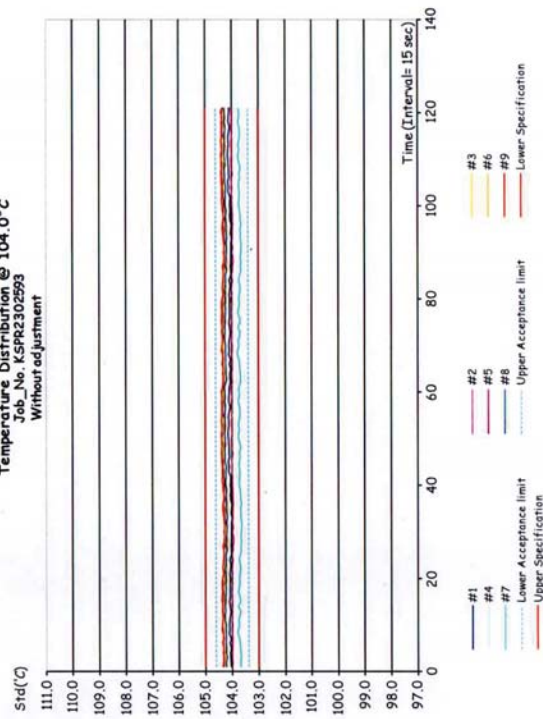
Corr\_Distribution & Max\_Measurement Uncertainty  
Job\_No. KSPR2302593  
Without adjustment



Temperature Distribution @ 180.0°C  
Job\_No. KSPR2302593  
Without adjustment (Cont.)



Temperature Distribution @ 104.0°C  
Job\_No. KSPR2302593  
Without adjustment





## ใบตรวจสอบสภาพเครื่องควบคุมอุณหภูมิ

เลขที่ใบงาน: KSPR2302593

ชนิดเครื่อง: Hot Air Oven

รุ่น: UF 55

หมายเลขเครื่อง: B219.0142 (WW-05-002)

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

ข้อแนะนำ:

Mr. Apiwit Chaosap  
Service Engineer

DKSH Thailand Co., Ltd.  
2533 หมู่ 10 ตำบลบางพลีใหญ่ อำเภอบางพลี จังหวัดสมุทรปราการ 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/identify-thailand

Delivering Growth - in Asia and Beyond.

# CAL

Calibratech Co., Ltd.

7/106-7 Moo 2, Sukhprachasan 3 Rd., Banggood, Pakkred, Nonthaburi 11120  
Tel: (02) 964-0211 Fax: (02) 964-5155, e-mail: calibratech.cal@yahoo.com, calibratech.cal@hotmail.com



NS-CAL-TIS 17025  
CALIBRATION 0036

## Certificate of Calibration

Page : 1 of 2

Certificate No. : 66-420017-1

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.



CAL-F0031-03

Certificate of Calibration

Certificate of Calibration

Certificate No. : 66-420017-1 Page : 2 of 2

Certificate No. : 66-400084-1 Page : 1 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%

- o10 -



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. : 66-400084-1

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%

- 000 -

*(Signature)*



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-TIS-TS 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  
Website: www.bangkokhighlab.com E-mail: info@bangkokhighlab.com



NSC-TIS-TIS 17025  
CALIBRATION 0366

Certificate No : S2022/168  
Page : 2/5

## 1. Photometric Accuracy

CRMs: Neutral Density Glass Filters  
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 $\pm$ (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 $\pm$ (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 $\pm$ (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 $\pm$ (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  
Website: www.bangkokhighlab.com E-mail: info@bangkokhighlab.com



NSC-TIS-TIS 17025  
CALIBRATION 0366

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 $\pm$ (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 $\pm$ (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

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

Blank Serial Number: 15178

Spectral slit width : 4.00 nm

Wavelength (nm)	Certificate (Abs)	Average Measured Value (A)	Correction (A)	Uncertainty $\pm$ (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, Bangkok, Bangkok 10220  
Tel: (662) 971-5800  
Website: www.bangkokhighlab.com  
E-mail: info@bangkokhighlab.com



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  
Website: www.bangkokhighlab.com  
E-mail: info@bangkokhighlab.com



Certificate No : S2022/168  
Page : 5/5

### 4. \*Stray Light

CRMs: Potassium Chloride aqueous solution  
CRMs Serial Number: 5469  
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  
Traceability: Traceable to toluene in hexane NIST SRM2034, through Starna certificate report no. 88923

Blank Serial Number: 8745

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

### Remarks:

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  
**Model:** TK 61  
**Serial No.:** 1P181269184  
**Manufacturer:** KIMO  
**Condition:** In Condition  
**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)**  
**(Mr. Pramote Ramong)**  
Person in charge  
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.

DKSH Technology (Thailand) Co., Ltd.  
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/certificate-thailand

Delivering Growth - In Asia and Beyond.

CAL-FM-C15-14: 06 Dec 2022



Certificate No.: C15230305

Page: 2 of 2

### Calibration Results: Without Adjustment

Sensor Type: TC Type K

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	

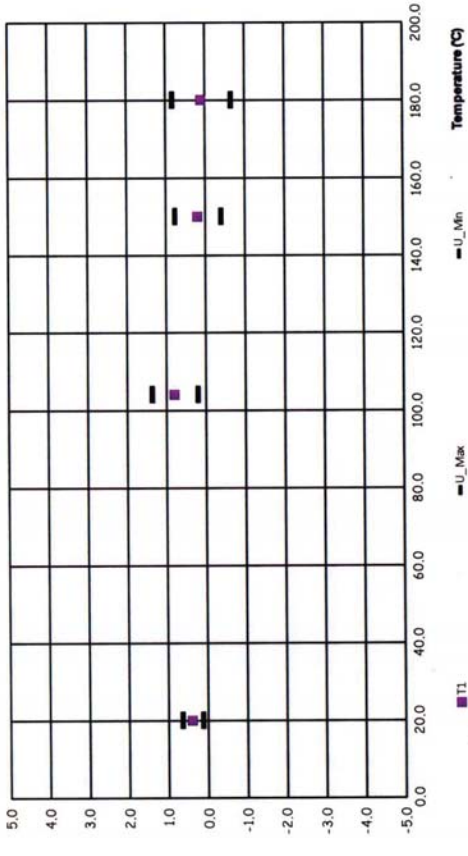
The End of Certificate

DKSH Technology (Thailand) Co., Ltd.  
2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260  
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/certificate-thailand

Delivering Growth - In Asia and Beyond.

CAL-FM-C15-14: 06 Dec 2022

Without Adjustment  
Job No.: KSPR2302595



## ใบตรวจสอบสภาพเครื่องมือวัดอุณหภูมิ

เลขที่ใบงาน: KSPR2302595  
รุ่น: TK 61

ชนิดเครื่องมือ: Digital Thermometer with Sensor  
หมายเลขเครื่อง: IP181269184

ตรวจสอบ (รับ)		รายการตรวจสอบ		ตรวจสอบ (ส่ง)		หมายเหตุ
16-Feb-2023	ไม่ปกติ	รายการตรวจสอบ		16-Feb-2023	ไม่ปกติ	
ปกติ	ไม่ปกติ	General		ปกติ	ไม่ปกติ	
<input checked="" 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 Karapilak  
Service Engineer



THAI HEART CALIBRATION CO., LTD.

112/1 Moo 5, Phraek Sa, Muang, Samut Prakan 10280  
Tel: 0-2394-2162, 0-2757-8443; 0-2757-8496 Fax: 0-2757-8507



AC-2695

## 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
Serial No.	19490640
Description	Resolution of UUC : 1 °C
Model	TR420
ID No.	WW-07-002

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 

Approved by 

Act as Technical Manager

Representative of Managing Director

( ) ( Krisyosl K. ) ( ) ( Sakda Y. )  
( ) ( Patiphan K. ) ( ) ( Onnapa P. )  
( ) ( Pongsak H. ) ( ) ( Nitiphong K. )  
( ) ( Kanung C. ) ( ) ( Nonthachai K. )  
( ) ( Pramong P. ) ( ) ( Noppol P. )

( Dr. Ekachai Purititwong )

This calibration certificate shall not be reproduced other than in full except with the prior written approval of the Thai Heart Calibration Co., Ltd.

FE-169

REV.02 02/24/21



THAI HEART CALIBRATION CO., LTD.

112/1 Moo 5, Phraek Sa, Muang, Samut Prakan 10280  
Tel: 0-2394-2162, 0-2757-8443; 0-2757-8496 Fax: 0-2757-8507



AC-2695

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	10-1308001/22	Aug. 12, 2023	THC

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

- THC, Thai Heart Calibration Co., Ltd.

Calibrated by

Apisit

REV.02 02/24/21

FE-169

Certificate No.: TT-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

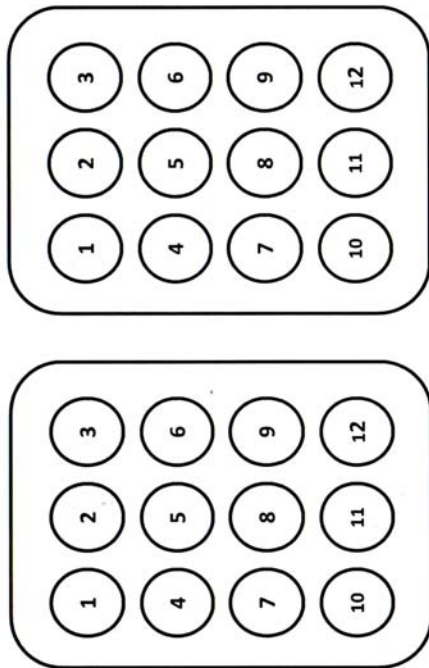
FE-169

Calibrated by Apisit  
REV.02 02/24/21

Certificate No.: TT-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 -

FE-169

Calibrated by Apisit  
REV.02 02/24/21



## 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 Peichkasem 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%

-oOo-





## THAI CALIBRATION SERVICES CO., LTD.

198 Moo 9 Soi Raikang 30 Puttamonthon 5 Rd., Sampran, Nakornpathom 73210  
Tel. 0-3439-7682-5 Fax: 0-3439-7687  
www.thaical.com E-mail : sale@thaicalibration.com, lab@thaicalibration.com



NSC-TIS-TIS 17025  
CALIBRATION 0189

## CALIBRATION CERTIFICATE

Certificate No.S23031535

page 1 of 2

**Customer :** C.E.M. TECHNOLOGY (THAILAND) CO., LTD.

31/8 Moo 13 Raikang,  
Sampran, Nakornpathom 73210

**Equipment :** Non-automatic weighing instrument (Electronic instrument)

**Manufacturer :** Sartorius

**Model :** BSA224S-CW

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

**Ambient temperature :** (24.1 ± 5.0) °C

**Relative humidity :** (47.5 ± 10.0) %

**Capacity :** 220000 mg

**Resolution :** 0.1 mg

**Received date :** 03-Mar-2023

**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 :** กรุงเทพมหานคร

**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<sup>3</sup>)**

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 Inanom  
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.

TCS-F-138 Issue 01/Rev.00/2 Jul 2018

No. 05234



## THAI CALIBRATION SERVICES CO., LTD.

198 Moo 9 Soi Raikang 30 Puttamonthon 5 Rd., Sampran, Nakornpathom 73210  
Tel. 0-3439-7682-5 Fax: 0-3439-7687  
www.thaical.com E-mail : sale@thaicalibration.com, lab@thaicalibration.com



NSC-TIS-TIS 17025  
CALIBRATION 0189

## CALIBRATION CERTIFICATE

Certificate No.S23031535

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--

TCS-F-138 Issue 01/Rev.00/2 Jul 2018

No. 05235



NSC-TISTR 1705  
CALIBRATION 0037

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66-0074

MTC No. EEL.BP. 17/1165

## CALIBRATION CERTIFICATE

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

Address : 31/8 Moo 13, Raikhing, Samphan, Nakhonpathom 73210.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., A.Muang, Samutprakan 10280.

### Instrument Calibrated :

Description : Sound Level Meter

Manufacturer : ACO

Model : 6236

Serial No. : 222128 (NS-03-013)

Microphone : Type 7052NR No.84161

Preamplifier : -

### Ambient Environment

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

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

Ambient Pressure :  $(101.325 \pm 1.5) \text{ kPa}$

### Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2633526.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 2 Nov. 2022

Date of Calibration : 3 Nov. 2022

1 / 9

47

The results relate only to the items tested/calibrated or value assigned.  
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

### Head Office

35 Mu. 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website:www.tistr.or.th

### Office/Laboratory

Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

### Office

196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

FMBL/MTC-002 Rev.4

เอกสารการสอบเทียบเครื่องมือตรวจวัดระดับเสียงในบรรยากาศ

Request No. 21-66/0074

MTC No. EEL.BP. 17/1165

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

#### Calibration Procedure :

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

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

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

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

Date of Calibration : 3 Nov. 2022

2/9

The results relate only to the items tested/calibrated or value assigned.  
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

**Head Office**  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rump@tistr.or.th Website: www.tistr.or.th

**Office/Laboratory**  
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

FM.BLMTC.002 Rev.4

Request No. 21-66/0074

MTC No. EEL.BP. 17/1165

#### 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Measured value (dB)		Deviation value (dB)	Acceptance limit Class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
	Before adjust	After adjust				
113.97	113.3	114.0	0.0	1.0	0.30	N/A

**Note:** The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 114.2 dB.

#### 2. Self-generated noise

##### 2.1 Normal test

Measured value (dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
20.6	0.10	N/A

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

Frequency Weighting	Measured value (dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
A-Weight	16.9	0.10	N/A
C-Weight	21.7	0.10	N/A
Flat	26.0	0.10	N/A

Date of Calibration : 3 Nov. 2022

3/9

The results relate only to the items tested/calibrated or value assigned.  
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

**Head Office**  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rump@tistr.or.th Website: www.tistr.or.th

**Office/Laboratory**  
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

FM.BLMTC.002 Rev.4

### 3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)		Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight			
125	0.0	0.0	1.5	0.45	0.6
1 000	-0.4	-0.4	1.0	0.45	0.6
8 000	-4.3	-4.4	5.0	0.45	0.7

### 4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from frequency response (dB)		Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
	A-weight	C-weight			
63	-0.4	0.0	2.0	0.20	0.6
125	-0.4	0.1	1.5	0.20	0.6
250	-0.3	0.1	1.5	0.20	0.6
500	-0.2	-0.1	1.5	0.20	0.6
1 000	0.0	-0.1	1.0	0.20	0.6
2 000	0.0	0.0	2.0	0.20	0.6
4 000	-0.2	0.0	3.0	0.20	0.6
8 000	-0.2	-0.5	5.0	0.20	0.7

Date of Calibration : 3 Nov. 2022

4/9

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

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

FMBL-MTC.002 Rev.4

**Head Office**  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpal@tistr.or.th Website: www.tistr.or.th

**Office/Laboratory**  
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

**Office**  
196 Phahonyothin Road, Chatuchak Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

### 5. Long-term stability

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

### 6. Frequency and time weightings at 1 kHz

6.1 Frequency weightings at 1 kHz					
Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
A-weight	94.0	0.0	0.2	0.20	0.2
C-weight	94.0	0.0	0.2	0.20	0.2
Flat	94.0	0.0	0.2	0.20	0.2

### 6.2 Time weightings at 1 kHz

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

Date of Calibration : 3 Nov. 2022

5/9

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

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

FMBL-MTC.002 Rev.4

**Head Office**  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpal@tistr.or.th Website: www.tistr.or.th

**Office/Laboratory**  
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

**Office**  
196 Phahonyothin Road, Chatuchak Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

7. Level linearity on the reference level range

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
122	122.1	0.1	1.1	0.30	0.3
121	121.1	0.1	1.1	0.30	0.3
120	120.1	0.1	1.1	0.30	0.3
119	119.1	0.1	1.1	0.30	0.3
114	114.0	0.0	1.1	0.30	0.3
109	109.0	0.0	1.1	0.30	0.3
104	104.0	0.0	1.1	0.30	0.3
99	99.0	0.0	1.1	0.30	0.3
94	94.0	0.0	1.1	0.30	0.3
89	88.9	-0.1	1.1	0.30	0.3
84	84.0	0.0	1.1	0.30	0.3
79	79.1	0.1	1.1	0.30	0.3
74	74.3	0.3	1.1	0.30	0.3
69	68.9	-0.1	1.1	0.30	0.3
64	63.8	-0.2	1.1	0.30	0.3
59	58.8	-0.2	1.1	0.30	0.3
54	53.8	-0.2	1.1	0.30	0.3
49	48.8	-0.2	1.1	0.30	0.3

Date of Calibration : 3 Nov. 2022

6/9

The results relate only to the items tested/calibrated or value assigned.  
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

**Head Office**  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpag@tistr.or.th Website: www.tistr.or.th

**Office/Laboratory**  
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

**Office**  
196 Phahonyothin Road, Chatuchak Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

FM.BLMTC.002 Rev.4

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

Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
44	43.9	-0.1	1.1	0.30	0.3
39	38.8	-0.2	1.1	0.30	0.3
34	34.1	0.1	1.1	0.30	0.3
33	33.2	0.2	1.1	0.30	0.3
32	32.2	0.2	1.1	0.30	0.3
31	31.3	0.3	1.1	0.30	0.3
30	30.4	0.4	1.1	0.30	0.3

8. Level linearity including the level range control

At reference sound level on the reference level range

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (±dB)	Uncertainty (±dB)	Maximum-permitted uncertainty of measurement (±dB)
40-130	94.0	94.0	0.0	1.1	0.30	0.3
30-120	94.0	94.0	0.0	1.1	0.30	0.3
20-110	94.0	94.0	0.0	1.1	0.30	0.3
20-100	94.0	93.9	-0.1	1.1	0.30	0.3

Date of Calibration : 3 Nov. 2022

7/9

The results relate only to the items tested/calibrated or value assigned.  
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

**Head Office**  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpag@tistr.or.th Website: www.tistr.or.th

**Office/Laboratory**  
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

**Office**  
196 Phahonyothin Road, Chatuchak Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

FM.BLMTC.002 Rev.4

8. Level linearity including the level range control

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

Range	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
40-130	45.0	45.0	0.0	1.1	0.30	0.3
30-120	35.0	35.0	0.0	1.1	0.30	0.3
20-110	25.0	25.6	0.6	1.1	0.30	0.3
20-100	25.0	25.6	0.6	1.1	0.30	0.3
20-90	25.0	25.5	0.5	1.1	0.30	0.3
20-80	25.0	25.7	0.7	1.1	0.30	0.3

9. Tone burst response

Time	Toneburst Duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 (dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
Fast	200	116.0	0.0	$\pm 1.0$	0.20	0.3
	2	98.9	-0.1	+1.0; -2.5	0.20	0.3
	0.25	89.9	-0.1	+1.5; -5.0	0.20	0.3
Slow	200	109.5	-0.1	$\pm 1.0$	0.20	0.3
	2	89.9	-0.1	+1.0; -5.0	0.20	0.3
SEL	200	109.9	-0.1	$\pm 1.0$	0.20	0.3
	2	90.0	0.0	+1.0; -2.5	0.20	0.3
	0.25	80.9	-0.1	+1.5; -5.0	0.20	0.3

Date of Calibration : 3 Nov. 2022

8/9

The results relate only to the items tested/calibrated or value assigned.  
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FMBL.MTC.002 Rev.4

**Head Office**  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website: www.tistr.or.th

**Office/Laboratory**  
Sri 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

**Office**  
196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

10. Peak C' sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
Complete cycle	125.4	125.7	0.3	3.0	0.20	0.35
Positive half cycle	124.4	124.2	-0.2	2.0	0.20	0.35
Negative half cycle	124.4	124.2	-0.2	2.0	0.20	0.35

11. Overload indication

Measured value (dB)	Deviated value (dB)		Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
	Positive one-half cycle	Negative one-half cycle			
130.0	130.0	130.0	1.5	0.20	0.25

12. High-level stability

Time	Measured value (dB)	Deviated value (dB)	Acceptance limit class 2 ( $\pm$ dB)	Uncertainty ( $\pm$ dB)	Maximum-permitted uncertainty of measurement ( $\pm$ dB)
Begin	129.0	0.0	0.3	0.10	0.1
End	129.0	0.0	0.3	0.10	0.1

Calibrated by :  (Mr. Pannasit Phasingsri)

Approved by :  (Mr. Pannasit Phasingsri)

(Mr. Pannasit Phasingsri)

(Mr. Pannasit Phasingsri)

Director

Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Date of Calibration : 3 Nov. 2022

Date of Issue : 3 Nov. 2022

Ref : 2011265110204749001

End of Certificate

9 / 9

The results relate only to the items tested/calibrated or value assigned.  
Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FMBL.MTC.002 Rev.4

**Head Office**  
35 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang,  
Changwat Pathumthani 12120, Thailand  
Tel. (66) 0 2577 9000  
Fax. (66) 0 2577 9009  
E-mail : rumpai@tistr.or.th Website: www.tistr.or.th

**Office/Laboratory**  
Sri 1C, Bangpoo Industrial Estate, Sukhumvit Road,  
Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2323 1672-80 ext. 115, 116  
Fax. (66) 0 2323 9165  
E-mail : mtc@tistr.or.th

**Office**  
196 Phahonyothin Road, Chatuchak, Bangkok 10900,  
Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217  
Fax. (66) 0 2579 8592  
E-mail : sumalee@tistr.or.th

## CERTIFICATE OF CALIBRATION

Certificate No. : 66S0205-3 Job No. : 66S0205 Page : 1 of 2

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

Address : 31/9 Moo 13, Raikhang, 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. : 222186 Date of received : 03-Feb-2023

Identity No. : NS-03-016 Date of calibration : 07-Feb-2023

Range : See to Data Date of issued : 09-Feb-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 Phannangkaew (MD)

Reviewed By : [ ] Mr. Sompong Sisert

[ ] Mr. Boonyarit Auejirakarn

[ ] Ms. Natthaparakarn Thammaphan

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

## Continuation of Calibration Report

Certificate No. : 66S0205-3 Job No. : 66S0205 Page : 2 of 2

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	104.2	0.2	0.20
	114	114.1	0.1	0.20
B	94	94.4	0.4	0.20
	104	104.2	0.2	0.20
	114	113.9	-0.1	0.20
Z	94	94.4	0.4	0.20
	104	104.1	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, Samphan,  
Nakhornpathom 73210  
Location : Laboratory

Equipment : Sound Level Meter : ( 20 ± 2 ) °C  
Manufacturer : ACO : Relative humidity : ( 50 ± 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  
**Reviewed By** : [ ] Mr. Sompong Srisert  
[ ] Ms. Natthaprakarn Thammaphan  
**Approved By** : [ ] Ms. Bhacharin Phanangkaew (MD)  
[ ] Mr. Boonyarit Auejirakarn

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

**Result of Calibration** : Without Adjustment  
**Function** : Sound Level Measurement  
**Calibration Range** : @ 1 kHz  
**Resolution** : 0.1 dB / 1 dB

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

*UUC\* = Unit Under Calibration*

- The End -

**CERTIFICATE OF CALIBRATION**

Certificate No. : 66S0420-23 Job No. : 66S0420 Page : 1 of 2

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

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

Nakhornpathom 73210

Location : Laboratory

Equipment : Sound Level Meter

Ambient temperature : ( 20 ± 2 ) °C

Manufacturer : ACO

Relative humidity : ( 50 ± 15 ) %

Model : 6236

Atmospheric pressure : -

Serial No. : 222192

Date of received : 30-Mar-2023

Identity No. : NS-03-022

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. Natthaparkarn Thammaphan

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

Result of Calibration : Without Adjustment

Function : Sound Level Measurement

Calibration Range : @ 1 kHz

Resolution : 0.1 dB / 1 dB

Response	Standard Setting ( dB )	UUC Reading ( dB )	Error Value ( dB )	Uncertainty ( +/-dB )
A	94	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, Raikhang, Samphran,  
Nakhornpathom 73210  
Location : Laboratory

Equipment : Sound Level Meter  
Manufacturer : ACO  
Model : 6236  
Serial No. : 222193  
Identity No. : NS-03-023  
Range : See to Data  
Ambient temperature : ( 20 ± 2 ) °C  
Relative humidity : ( 50 ± 15 ) %  
Atmospheric pressure : -  
Date of received : 30-Mar-2023  
Date of calibration : 03-Apr-2023  
Date of issued : 05-Apr-2023

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

### Reference Standard Instruments :

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

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

Calibrated By : Mr. Boonyarit Auejirakarn

Approved By :

[ ] Ms. Bhacharin Phanangkaew (MD)

Reviewed By : [ ] Mr. Sompong Srisert

[ ] Mr. Boonyarit Auejirakarn

✓ [ ] Ms. Natthaprakarn Thammaphan

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

Result of Calibration : Without Adjustment  
Function : Sound Level Measurement  
Calibration Range : @ 1 kHz  
Resolution : 0.1 dB / 1 dB

Response	Standard Setting ( dB )	UUC Reading ( dB )	Error Value ( dB )	Uncertainty ( +/-dB )
A	94	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 :  $(20 \pm 2) ^\circ\text{C}$   
Manufacturer : ACO Relative humidity :  $(50 \pm 15) \%$   
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	EELBP.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 Auejitrakarn*  
Reviewed By : *Mr. Sompong Srisert*  
*Ms. Natthaparakarn Thammaphan*  
Approved By : *Ms. Bhacharin Phanangkaew (MD)*  
*Mr. Boonyarit Auejitrakarn*

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

## Continuation of Calibration Report

Page : 2 of 2  
Job No. : 66S0330-3  
Certificate No. : 66S0330-3

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. : 66S0929-3 Job No. : 66S0929 Page : 1 of 2

Customer : C.E.M. Technology (Thailand) Co.,Ltd.  
Address : 31/8 Moo 13, Raikhing, Samphan,  
Nakhornpathom 73210  
Location : Laboratory

Equipment : Sound Level Meter Ambient temperature :  $(20 \pm 2) ^\circ\text{C}$   
Manufacturer : BSWA Tech Relative humidity :  $(50 \pm 15) \%$   
Model : BSWA 309 Atmospheric pressure : -  
Serial No. : 590014 Date of received : 11-Sep-2023  
Identity No. : NS-04-001 Date of calibration : 14-Sep-2023  
Range : See to Data Date of issued : 18-Sep-2023

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

**Reference Standard Instruments** :

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

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

**Calibrated By** : Mr. Boonyarit Auejirakarn  
**Reviewed By** : [ ] Mr. Sompong Srisert  
[ ] Ms. Natthaprakarn Thammaphan  
**Approved By** : [ ] Ms. Bhacharin Phanangkaew (MD)  
[ ] Mr. Boonyarit Auejirakarn

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

## Continuation of Calibration Report

Certificate No. : 66S0929-3 Job No. : 66S0929 Page : 2 of 2

**Result of Calibration** : Without Adjustment  
**Function** : Sound Level Measurement  
**Calibration Range** : @ 1 kHz  
**Resolution** : 0.1 dB / 1 dB

Response	Standard Setting (dB)	UUC Reading (dB)	Error Value (dB)	Uncertainty (+/-dB)
A	94	94.0	0.0	0.20
	104	104.0	0.0	0.20
	114	114.0	0.0	0.20
B	94	94.0	0.0	0.20
	104	104.0	0.0	0.20
	114	114.0	0.0	0.20
Z	94	94.0	0.0	0.20
	104	104.1	0.1	0.20
	114	114.1	0.1	0.20

UUC\* = Unit Under Calibration

- The End -

## CERTIFICATE OF CALIBRATION

Certificate No. : 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 :  $(20 \pm 2) ^\circ\text{C}$   
 Manufacturer : Tenmars Relative humidity :  $(50 \pm 15) \%$   
 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 : *[Signature]*  
 Reviewed By : *[Signature]* *Mr. Sompong Srisert*  
*Ms. Natthaparakarn Thammaphan* *Ms. Bhacharin Phanangkaew (MD)*  
*Mr. Boonyarit Auejirakarn*

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

Result of Calibration : Without Adjustment

Function : Sound Level Measurement

Calibration Range : @ 1 kHz

Resolution : 0.1 dB / 1 dB

Response	Standard Setting (dB)	UUC Reading (dB)	Error Value (dB)	Uncertainty (+/-dB)
A	94	94.5	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. : 66S0330-8 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 :  $(20 \pm 2) ^\circ\text{C}$   
 Manufacturer : Scarlet Tech Relative humidity :  $(50 \pm 15) \%$   
 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	EELBP.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 Phannangkaw (MD)

Reviewed By : ☐ Mr. Sompong Srisert

☒ Ms. Natthaprakarn Thammaphan

☒ Mr. Boonyarit Auejirakarn

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

## Continuation of Calibration Report

Job No. : 66S0330

Page : 2 of 2

Certificate No. : 66S0330-8

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 -

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 :   
ISSUED DATE : 9-May-23

Calibration Report

EQUIPMENT : SOUND LEVEL METER  
MANUFACTURER : ACO  
MODEL : TYPE 6226  
ID No. : CEM-SI-01  
RECEIVED DATE : 4-May-23  
AMBIENT TEMPERATURE : 22 °C ± 3°C  
RELATIVE HUMIDITY : 50%RH ± 20%RH  
SERIAL NUMBER : 060209  
CALIBRATION DATE : 9-May-23

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

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	-16.80	-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

## Certificate of Calibration

EQUIPMENT : SOUND LEVEL METER  
 MANUFACTURER : ACO  
 MODEL : TYPE 6226  
 SERIAL No. : 090057  
 ID No. : CEM-SI-02  
 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 :   
 ISSUED DATE : 9-May-23

## Calibration Report

EQUIPMENT : SOUND LEVEL METER  
 MANUFACTURER : ACO  
 MODEL : TYPE 6226  
 ID No. : CEM-SI-02  
 RECEIVED DATE : 4-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. CERTIFICATE No. DUE DATE  
 1) MULTIFUNCTION 1986 01827 EEL BP 55/0974 12-Jan-24  
 SOUND CALIBRATOR.

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

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 :   
ISSUED DATE : 9-May-23

Calibration Report

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

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

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

## Certificate of Calibration

**EQUIPMENT** : SOUND LEVEL METER  
**MANUFACTURER** : ACO  
**MODEL** : TYPE 6226  
**SERIAL No.** : 122024  
**ID No.** : CEM-SI-04  
**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** :   
**ISSUED DATE** : 9-May-23

## Calibration Report

**EQUIPMENT** : SOUND LEVEL METER  
**MANUFACTURER** : ACO  
**MODEL** : TYPE 6226  
**ID No.** : CEM-SI-04  
**RECEIVED DATE** : 4-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** : 1) MULTIFUNCTION  
**MODEL** : 1986  
**SERIAL No.** : 01827  
**CERTIFICATE No.** : EEL BP 55/0974  
**DUE DATE** : 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)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-16.10	-15.80	0.50
250.00	-8.60	-8.10	0.50
500.00	-3.20	-3.0	0.50
1000.00	0.00	0.00	0.50
2000.00	1.20	0.90	0.50

2. C-WEIGHTING ACOUSTIC FREQUENCY RESPONSE			
FREQUENCY (Hz)	STANDARD EXPECTED READING (dB)	UUC READING (dB)	UNCERTAINTY OF MEASUREMENT (±dB)
125.00	-0.20	0.1	0.50
250.00	0.00	0.5	0.50
500.00	0.00	0.3	0.50
1000.00	0.00	0.0	0.50
2000.00	-0.20	-0.4	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

## 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** :   
**CALIBRATION DATE** : 9-May-23

**APPROVED BY** :   
**ISSUED DATE** : 9-May-23

## Calibration Report

**EQUIPMENT** : SOUND LEVEL METER  
**MANUFACTURER** : ACO  
**MODEL** : TYPE 6226  
**ID No.** : CEM-SI-09  
**RECEIVED DATE** : 4-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** : 1) MULTIFUNCTION  
**MODEL** : 1986  
**SERIAL No.** : 01827  
**CERTIFICATE No.** : EEL BP 55/0974  
**DUE DATE** : 12-Jan-24

- SOUND CALIBRATOR.
- 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

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 :   
CALIBRATION DATE : 9-May-23

APPROVED BY :   
ISSUED DATE : 9-May-23

Calibration Report

EQUIPMENT : SOUND LEVEL METER  
MANUFACTURER : ACO  
MODEL : TYPE 6226  
ID No. : CEM-SI-10  
RECEIVED DATE : 4-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 :-

1) MULTIFUNCTION : MODEL : 1986 SERIAL No. : 01827 CERTIFICATE No. : EEL BP 55/0974 DUE DATE : 12-Jan-24

SOUND CALIBRATOR.

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



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: 3264	Tech: Tong.P

### Site Conditions

Barometric Pressure (in Hg): 27.00	Corrected Pressure (mm Hg): 685.8
Temperature (deg F): 75.0	Temperature (deg K): 297.0
Average Press. (in Hg): 26.00	Corrected Average (mm Hg): 660.4
Average Temp (Deg F): 74.2	Average Temp: (Deg K): 296.6

### 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	6.80	1.577	62.1	59.09	Slope: 33.1580
2	5.00	1.354	55.4	52.71	Intercept: 7.2943
3	3.60	1.150	48.2	45.86	Corr. Coeff: 0.9980
4	3.10	1.068	45.0	42.82	
5	2.50	0.960	40.5	38.53	# 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

Inter Average I (chart): 44.0
Average Flow Calculation m3/min 1.019916094
Average Flow Calculation in cfm 36.01398589
Sample Time (Hrs): 24.0
Total flow in 24 hours m3/min 1468.679175
Total flow in 24 hours cfm 51860.13967

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

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) (corrected)	IC	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

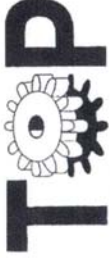
Ta = actual temperature during calibration (deg K)  
Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K  
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:  
 $1/m((I[\text{Sqrt}(298/Tav)(Pav/760)]-b)$

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

inter 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: - Date: 17 Oct 22  
Sampler: TE-5000 TSP Serial No: 3273 Tech: Tong, P

### Site Conditions

Barometric Pressure (in Hg): 28.00 Corrected Pressure (mm Hg): 759.8  
Temperature (deg F): 77.0 Temperature (deg K): 298.2  
Average Press. (in Hg): 30.00 Corrected Average (mm Hg): 760.9  
Average Temp (Deg F): 76.9 Average Temp: (Deg K): 298.1

### 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) (corrected)	IC (corrected)	Linear Regression
1	7.90	1.784	57.0	56.98	Slope: 29.5755
2	6.10	1.569	51.0	50.98	Intercept: 4.4602
3	5.00	1.422	47.0	46.98	Corr. Coeff: 0.9992
4	3.80	1.241	41.0	40.98	
5	3.20	1.139	38.0	37.99	# 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:  
 $1/m[(I)(\text{Sqrt}(298/Tav)(Pav/760)) - b]$

Inter Average I (chart): 39.6  
Average Flow Calculation m3/min  
1.188720088  
Average Flow Calculation in cfm  
41.97457882  
Sample Time (Hrs): 24.0  
Total flow in 24 hours m3/min  
1711.756926  
Total flow in 24 hours cfm  
60443.3935

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

Inter 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: - Date: 18 Oct 22  
Sampler: TE-5000 TSP Serial No: 3275 Tech: Tong, P

### Site Conditions

Barometric Pressure (in Hg): 29.00 Corrected Pressure (mm Hg): 736.6  
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): 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) (corrected)	IC	Linear Regression
1	7.70	1.735	56.0	55.12	Slope: 30.6424
2	5.90	1.520	51.0	50.20	Intercept: 2.6696
3	4.80	1.372	45.6	44.88	Corr. Coeff: 0.9949
4	4.00	1.253	42.0	41.34	
5	3.40	1.156	38.0	37.40	# of Observations: 5

### Calculations

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

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

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

Tstd = 298 deg K  
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:  
 $1/m((I)[\sqrt{(298/Tav)(Pav/760)}]) - b]$

Inter Average I (chart): 39.0  
Average Flow Calculation m3/min  
1.188166607  
Average Flow Calculation in cfm  
41.95503499  
Sample Time (Hrs): 24.0  
Total flow in 24 hours m3/min  
1710.959913  
Total flow in 24 hours cfm  
60415.25039

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

Tisch Environmental 145 South Miami Ave, Cleves OH 45002 • 877.263.7610 • sales@tisch-env.com • www.tisch-env.com



Trade & Engineering

## TSP High Volume Sampler TE-5000 TSP Sampler Verification

### Site Information

Location: - 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): 76.4 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) (corrected)	IC	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

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

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

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

Tstd = 298 deg K  
Pstd = 760 mm Hg

For subsequent calculation of sampler flow:  
 $1/m((I)[\sqrt{(298/Tav)(Pav/760)}]) - b]$

Inter 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

Tisch Environmental 145 South Miami Ave, Cleves OH 45002 • 877.263.7610 • sales@tisch-env.com • www.tisch-env.com



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: 3279 Tech: Tong, P

### Site Conditions

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

### Calibration Orifice

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

### Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart) (corrected)	IC (corrected)	Linear Regression Slope	Intercept	Corr. Coeff.	# of Observations
1	7.50	1.714	52.0	51.23	28.0882	3.8314	0.9960	5
2	5.60	1.482	47.0	46.30				
3	4.40	1.315	42.0	41.38				
4	3.30	1.140	36.0	35.47				
5	2.70	1.032	33.0	32.51				

### 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

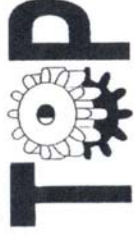
inter Average I (chart): 40.1  
Average Flow Calculation m3/min  
1.268735746

Average Flow Calculation in cfm  
44.79999045

Sample Time (Hrs): 24.0  
Total flow in 24 hours m3/min  
1826.979474

Total flow in 24 hours cfm  
64511.98624

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: 1629 Tech: Tong P.

### Site Conditions

Barometric Pressure (in Hg): 29.00 Corrected Pressure (mm Hg): 736.6  
Temperature (deg F): 76.0 Temperature (deg K): 297.4  
Average Press. (in Hg): 28.50 Corrected Average (mm Hg): 723.9  
Average Temp. (deg F): 75.6 Average Temp. (deg K): 297.2

### 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) (corrected)	IC (corrected)	Linear Regression Slope	Intercept	Corr. Coeff.	SFR	SSP	# of Observations
1	8.10	1.152	59.2	37.62	31.6154	1.7368	0.9952	1.111	58.03	5
2	6.30	1.017	54.2	34.44						
3	5.10	0.916	49.2	31.26						
4	4.30	0.842	44.1	28.02						
5	3.10	0.716	38.0	24.15						

### Calculations

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

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

Qa = actual flow rate  
IC = corrected chart response  
m = calibrator slope  
b = sampler intercept

Ta = actual temperature (deg K)  
Pa = actual pressure (mm Hg)  
For subsequent calculation of sampler flow:

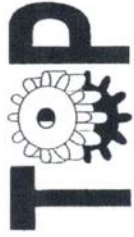
Ps = Average pressure (mm Hg)  
Ts = Average temperature (deg K)

Average I (chart): 56.9  
Average Flow over Sample (m3/min)  
1.098289496

Enter Total Time (Hrs): 24.0  
Total flow over sample (m3/min)  
1581.536874

Total flow over sample (CFM)  
55844.06701

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: 3115 Tech: Tong P.

### Site Conditions

Barometric Pressure (in Hg): 29.00 Corrected Pressure (mm Hg): 760.1  
Temperature (deg F): 77.0 Temperature (deg K): 298.0  
Average Press. (in Hg): 28.00 Corrected Average (mm Hg): 760.8  
Average Temp. (deg F): 77.6 Average Temp. (deg K): 298.3

### 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	# of Observations:
1	6.90	1.049	58.0	36.32	Slope 27.3102	5
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	

### Calculations

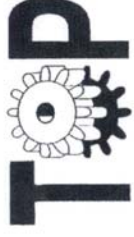
$$Qa = 1/m(\sqrt{(H2O)(Ta/Pa)}) - b$$
$$IC = I(\sqrt{(Ta/Pa)})$$

$$SFR = 1.13(Ps/Pa)(Ta/Ts)$$
$$SSP = (m \cdot SFR + b)(\sqrt{(Pa/Ta)})$$

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

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: 4 October 2022  
Sampler: TE-6070 PM10 Serial No: 3183 Tech: Tong P.

### Site Conditions

Barometric Pressure (in Hg): 29.52 Corrected Pressure (mm Hg): 760.1  
Temperature (deg F): 77.1 Temperature (deg K): 298.1  
Average Press. (in Hg): 29.94 Corrected Average (mm Hg): 761.2  
Average Temp. (deg F): 76.8 Average Temp. (deg K): 297.9

### 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	# of Observations:
1	5.00	0.894	43.0	26.93	Slope 29.1674	5
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	

### Calculations

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

$$SFR = 1.13(Ps/Pa)(Ta/Ts)$$
$$SSP = (m \cdot SFR + b)(\sqrt{(Pa/Ta)})$$

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

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

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



## 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 Corrected Pressure (mm Hg): 759.0  
Temperature (deg F): 76.9 Temperature (deg K): 297.9  
Average Press. (in Hg): 28.70 Corrected Average (mm Hg): 760.2  
Average Temp. (deg F): 77.0 Average Temp. (deg K): 298.0

### Calibration Orifice

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

### Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)	Linear Regression	# of Observations:
1	7.40	1.086	56.0	35.09	Slope 32.3113	5
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	

### Calculations

$Qa = 1/m(\sqrt{(H2O)(Ta/Pa)}) - b$   
 $IC = I(\sqrt{(Ta/Pa)})$   
 $m = \text{sampler slope}$   
 $b = \text{sampler intercept}$   
 $I = \text{chart response}$   
 $Tav = \text{daily average temperature}$   
 $Pav = \text{daily average pressure}$

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

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



## PM10 High Volume Sampler Verification

### Site Information

Location: - Site ID: - Date: 10 January 2023  
Sampler: TE-6070 PM10 Serial No: 3260 Tech: Tong P.

### Site Conditions

Barometric Pressure (in Hg): 27.00 Corrected Pressure (mm Hg): 685.8  
Temperature (deg F): 75.5 Temperature (deg K): 297.2  
Average Press. (in Hg): 26.40 Corrected Average (mm Hg): 670.6  
Average Temp. (deg F): 75.0 Average Temp. (deg K): 296.9

### Calibration Orifice

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

### Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart)	IC (corrected)	Linear Regression	# of Observations:
1	8.10	1.193	59.2	38.97	Slope 31.6154	5
2	6.30	1.053	54.2	35.68	Intercept 1.8101	
3	5.10	0.949	49.2	32.39	Corr. Coeff 0.9952	
4	4.30	0.872	44.1	29.03	SFR 1.106	
5	3.10	0.742	38.0	25.01	SSP 55.87	

### Calculations

$Qa = 1/m(\sqrt{(H2O)(Ta/Pa)}) - b$   
 $IC = I(\sqrt{(Ta/Pa)})$   
 $m = \text{sampler slope}$   
 $b = \text{sampler intercept}$   
 $I = \text{chart response}$   
 $Tav = \text{daily average temperature}$   
 $Pav = \text{daily average pressure}$

Average I (chart): 53.1  
Average Flow over Sample (m3/min): 1.060313912  
Enter Total Time (Hrs): 24.0  
Total flow over sample (m3/min): 1526.852034  
Total flow over sample (CFM): 53913.14532

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



## PM10 High Volume Sampler Verification

### Site Information

Location: - Site ID: -  
Sampler: TE-6070 PM10 Serial No: 3286

Date: 4 October 2022  
Tech: Tong P.

### Site Conditions

Barometric Pressure (in Hg): 27.00 Corrected Pressure (mm Hg): 760.1  
Temperature (deg F): 77.6 Temperature (deg K): 298.3  
Average Press. (in Hg): 30.00 Corrected Average (mm Hg): 761.2  
Average Temp. (deg F): 77.9 Average Temp. (deg K): 298.5

### Calibration Orifice

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

### Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart) (corrected)	IC	Linear Regression	# of Observations:
1	7.50	1.093	56.0	35.08	Slope 31.5206	5
2	5.90	0.971	51.0	31.95	Intercept 0.9099	
3	4.60	0.858	45.0	28.19	Corr. Coeff 0.9973	
4	3.80	0.781	40.0	25.06	SFR 1.1131	
5	2.90	0.684	36.0	22.55	SSP 58.36	

### Calculations

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

$$SFR = 1.13(Ps/Pa)(Ta/Ts)$$
$$SSP = (m \cdot SFR + b)(\sqrt{(Pa/Ta)})$$

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

Average I (chart): 55.4  
Average Flow over Sample (m3/min): 1.071752758  
Enter Total Time (Hrs): 24.0  
Total flow over sample (m3/min): 1543.323972  
Total flow over sample (CFM): 54494.76945

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



## PM10 High Volume Sampler Verification

### Site Information

Location: - Site ID: -  
Sampler: TE-6070 PM10 Serial No: 3310

Date: 4 October 2022  
Tech: Tong P.

### Site Conditions

Barometric Pressure (in Hg): 29.47 Corrected Pressure (mm Hg): 760.1  
Temperature (deg F): 77.0 Temperature (deg K): 298.0  
Average Press. (in Hg): 28.70 Corrected Average (mm Hg): 761.3  
Average Temp. (deg F): 77.1 Average Temp. (deg K): 298.1

### Calibration Orifice

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

### Calibration Data

Plate or Test #	In H2O	Qa (m3/min)	I (chart) (corrected)	IC	Linear Regression	# of Observations:
1	7.60	1.100	57.0	35.69	Slope 32.3375	5
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 1.1132	
5	2.80	0.671	35.0	21.91	SSP 59.28	

### Calculations

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

$$SFR = 1.13(Ps/Pa)(Ta/Ts)$$
$$SSP = (m \cdot SFR + b)(\sqrt{(Pa/Ta)})$$

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

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

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.*

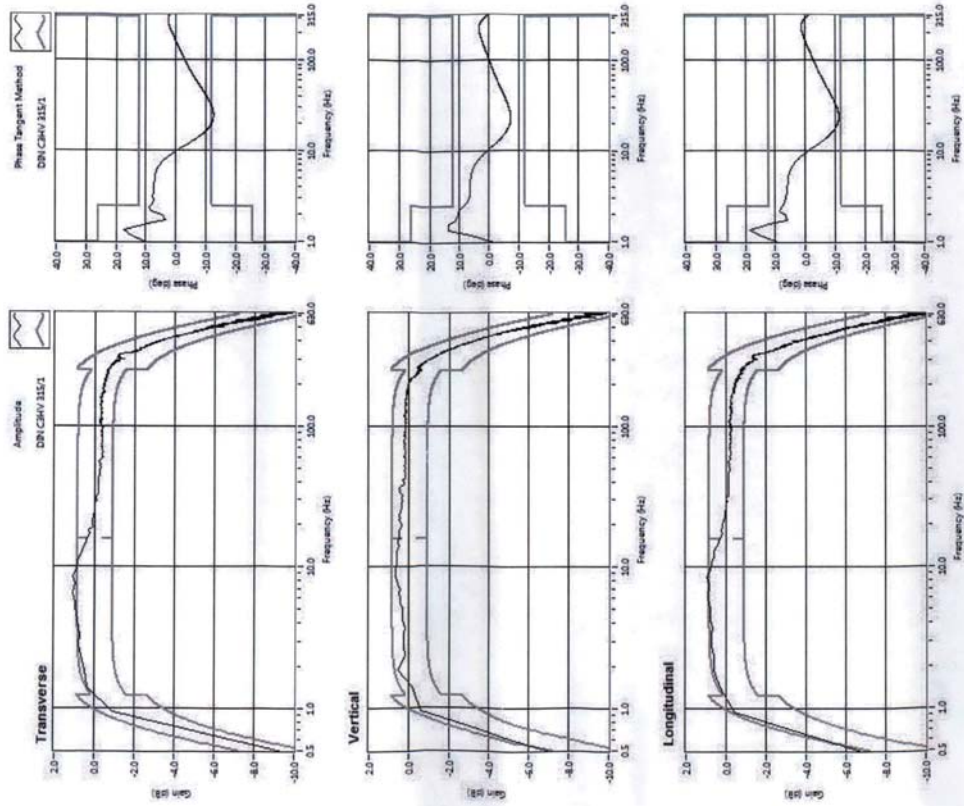
*Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a 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 Leggett 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: UM20454  
 Calibration Date: April 21, 2023  
 Calibration Reference Equipment: SRV-AFR 714J7401

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: Martin Hogue

**Instantel**  
 309 Leggett Drive, Ottawa, Ontario, K2K 3A3, (613) 592-4642

Instantel



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

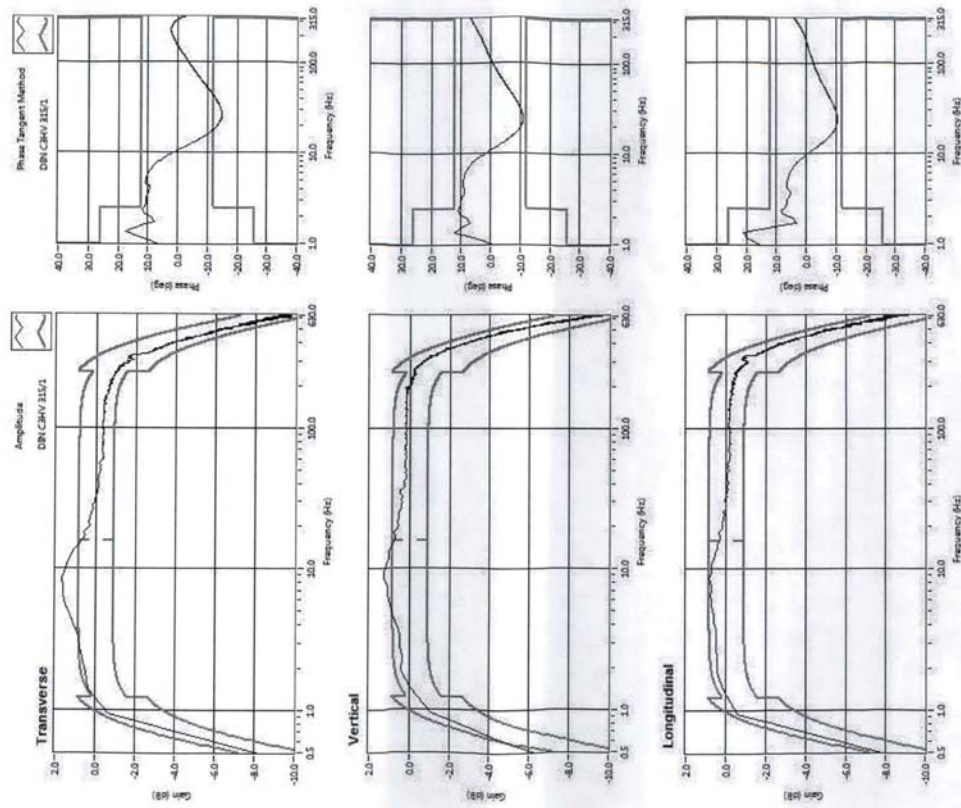
Calibrated by: Ms. Juntaporn Kunhakom

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.

Frequency Response of UM20454 (As Found)





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 :-

Instrument	Model	Serial No.	Cert. No.	Due Date
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 ± (%)	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	
20.0	50	50.021	49.955	-0.066	1.5	
	10	10.001	9.939	-0.062	1.5	
	25.0	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.: CP202020309EA

### 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	

#### Remark

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

-- End of Report --



Certificate No.: CP202020309EA

### 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 --