



www.accl-calibration.com
www.accl-cal.com
www.nonthaburiaccl.com

ADVANTAGE CENTER CO., LTD.

59/494 M.6, Frakham Road, T.Kukhot, Lumlookkar, Pathumthani 12130 Thailand.

Tel. (66-2) 9873248-50 Fax: (66-2) 9873252 E-mail: info.accl2662@gmail.com

pomsak2008@yahoo.co.th



CALIBRATION LABORATORY

Certificate No. RA-2302045-1

Job No.: RA-2302045

Certificate of Calibration

FOR

Equipment Name : Personal Heat Stress Monitor

Manufacturer : Quest Technologies

Model : Questtemp II

Serial Number : JUB090006

Customer Code : N/A

Location of Calibration : In Lab

Customer Name : Smile Laboratory Co.,Ltd.

563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok 10160

Calibration Procedure : CPT-04-11

Received Date: Feb 27, 2023

Calibration Date : Feb 28, 2023

Recommended Due Date : N/A

Environmental Conditions

Ambient Temperature : $(25 \pm 2) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \% \text{RH}$

Result : No Adjustment (See data attached in page 3 to the end of certificate)

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

Calibrated by : V. Surasak

Approved by :


(Pomsak Suksawaeng)

Date of Issue : Feb 24, 2023

Laboratory Management

Certificate No.: RA-2302045-1

Reference Standards

Equipment Name	Serial No.	Certificate No.	Due Date	Traceability to
Data Logger	ID.ACCL0200	22H2138	Oct 3, 2024	TPA

Traceability

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

- TPA : Technology Promotion Association (Thailand-Japan)



Certificate No. : RA-2302045-1

Result of Calibration

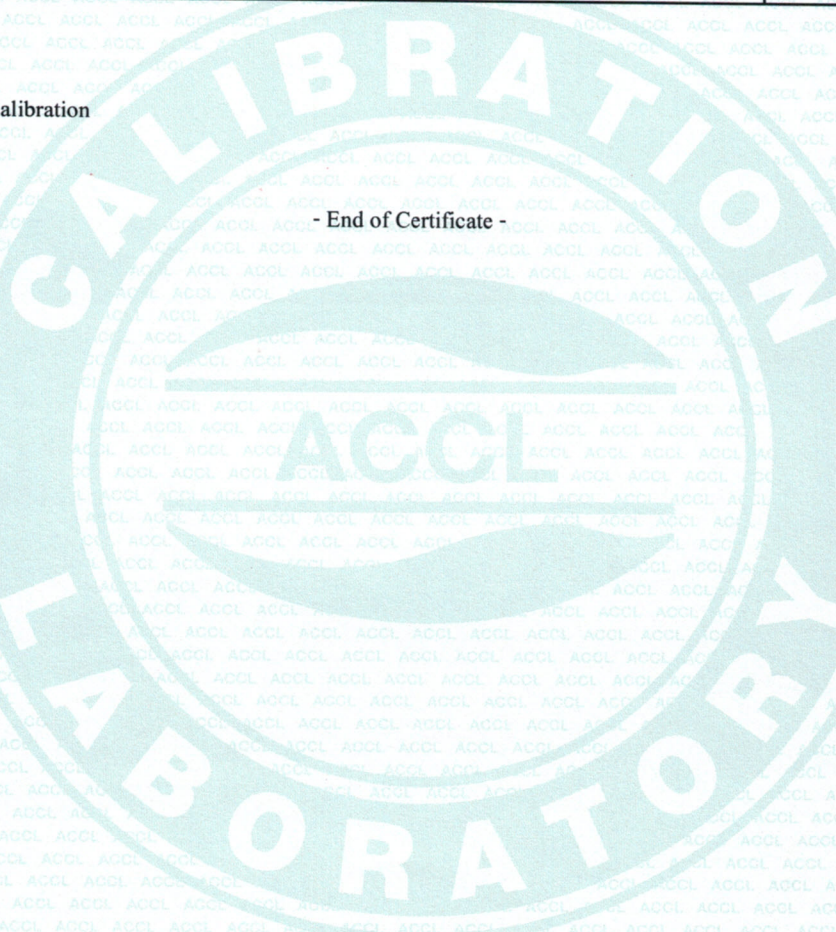
Temperature measurement

STD Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty of Measurement ($\pm^\circ\text{C}$)
37.024	37.2	-0.176	0.50

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -





GIIC Calibration Laboratory

700/20-21 Phaholyothin Rd., Samsennai, Phayathai,
Bangkok 10400 Thailand

Tel : +66 (02) 615 4999

Fax : +66 (02) 615 4644

E-mail : cal@giic.co.th



CERTIFICATE No.: CAL00344-23

PAGE: 1

OF: 3

Certificate of Calibration

Equipment : MULTI-LED LIGHT METER

Manufacturer : KEPLER

Model / Type : KLM-25L

Serial No. : 220800430

ID No. : -

Customer : Smile Laboratory Co.,Ltd.

563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok, 10160

C.S.R. No. : L0000372-23

Received Date : 14 March 2023

Calibration Date : 16 March 2023

Calibrated By : MR. TONTRAKARN SRIKACHA

Approved By : MR. NATTAPOL KINGKAEW

Issue Date : 16 March 2023

The uncertainties are for a level of confidence of approximately 95%.

This certificate may not be reproduced except in full unless permission for the reproduction has been obtained in writing from the laboratory.



CALIBRATION REPORT

Condition of this calibration result :

1. Environment : Temperature : $(23 \pm 3) ^\circ\text{C}$
 Relative Humidity : $(50 \pm 15) \%$

2. Reference / Procedure Used :

- This Instrument was calibrated by substitution with reference illuminance meter, the Instrument and reference illuminance meter were mounted with the plane of its diffuser vertical and normal to the direction of measurement. Calibration was illuminated by the luminous standard lamp (operated at colour temperature 2856K) according to GIIC Calibration Laboratory calibration procedure No.GIICLAB-CP-L01.

3. Reference Standard Instrument :

Instrument	Model	Serial No	Certificate No	Due Dated
Illuminance meter	PMA2200 / PMA2130	25531 / 025000	TP-1018-22	21 Jul 23

4. This Certification is traceable to the SI unit through :

- The National Institute of Metrology (Thailand) .

5. Uncertainty :

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



CALIBRATION REPORT

All data shown below were as received value : Without adjustment

Calibration result :

Function: Illuminance Measurement

L0

¹ UUC Range (lux)	Standard Setting (lux)	¹ UUC Reading (lux)	Error (lux)	Uncertainty of measurement ± (lux)
AUTO RANGE	0	0.00	0.00	0.60
	50	49.7	-0.3	1.6
	250	250.6	0.6	6.5
	500	502	2	13
	1000	1004	4	26
	1500	1506	6	36
	2000	2009	9	48
	3000	3007	7	72
	4000	4000	0	96
	5000	5000	0	0.12 klux

¹UUC = Unit Under Calibration

This result of calibration was found accurate as show on data and place of calibration only.

- END -

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0580

MTC No. EEL. BP. 10/0766

CALIBRATION CERTIFICATE

Submitted by : Smile Laboratory Co.,Ltd.

Address : 563/1, Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok, 10160, Thailand.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Acoustic Calibrator

Manufacturer : Quest Technologies

Model : QC-20

Serial No. : QF4090085

Ambient Environment

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

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

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used :

1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
7. Condenser Microphone B&K 4180 S/N 2633526.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at 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.

Date of Receipt : 5 Jul. 2023

Date of Calibration : 14 Jul. 2023

1 / 3

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

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

FM.BL.MTC.002 Rev.4

Head Office

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

Office/Laboratory

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

Office

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

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0580

MTC No. EEL. BP. 10/0766

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%.

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa , Corrected to Reference Conditions : 101.325 kPa , 23.0°C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.85	-0.15	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1000.4	0.4	± 1.5	$\pm 1.0\%$

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.40	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Date of Calibration : 14 Jul. 2023

2 / 3 ✓

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

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

FM.BL.MTC.002 Rev.4

Head Office

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

Office/Laboratory

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

Office

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

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0580

MTC No. EEL. BP. 10/0766

Nominal Output of Unit Under Test = 114 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa , Corrected to Reference Conditions : 101.325 kPa , 23.0 °C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	114.01	0.01	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1000.4	0.4	± 1.5	$\pm 1.0\%$

3. Total Distortion


Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	0.44	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :


(Mr. Weerachai Deechaiyae)

Approved by :


(Mr. Prawate Kluaypa)
Director

Date of Calibration : 14 Jul. 2023

Date of Issue : 17 Jul. 2023

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011266070502629001

End of Certificate

3 / 3

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

FM.BL.MTC.002 Rev.4

Head Office

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

Office/Laboratory

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

Office

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

CALIBRATION LABORATORY

Certificate No. RA-2401042-10

Job No. RA-2401042

Certificate of Calibration

FOR

Equipment Name : Noise Dosimeter

Manufacturer : SVANTEK

Model : SV104

Serial Number : 103282

Customer Code : N/A

Location of Calibration : In Lab

Customer Name : Smile Laboratory Co., Ltd.

563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok 10160

Calibration Procedure : CPE-04-01

Received Date : Jan 22, 2024

Calibration Date : Jan 24, 2024

Recommended Due Date : N/A

CONDITION AS RECEIVED : Normal

Environmental Conditions

Ambient Temperature : $(25 \pm 2) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \% \text{RH}$

Result : No Adjustment (See data attached in page 3 to the end of certificate)

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

Calibrated by : V. Surasak

Approved by :



(Signature)
(Pornsak Suksawaeng)

Date of Issue : Jan 24, 2024

Laboratory Management

Certificate No.: RA-2401042-10

Reference Standards

Equipment Name	Serial No.	Certificate No.	Due Date	Traceability to
Sound Calibrator	170603302	EEL.BP.108/1066	Oct 30, 2024	TISTR

Traceability

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

- TISTR : Thailand Institute of Scientific and Technological Research



Certificate No. : RA-2401042-10

Result of Calibration

Calibration Range : 94 dB, 114 dB

Function : Measurement @ 1 kHz

Select A Fast response

STD Setting	UUC Reading (dB)	Correction (dB)	Uncertainty of Measurement (± dB)
94.56 dB	94.4	0.16	0.88
114.52 dB	114.5	0.02	0.88

Select A Slow response

STD Setting	UUC Reading (dB)	Correction (dB)	Uncertainty of Measurement (± dB)
94.56 dB	94.4	0.16	0.88
114.52 dB	114.5	0.02	0.88

Select C Fast response

STD Setting	UUC Reading (dB)	Correction (dB)	Uncertainty of Measurement (± dB)
94.56 dB	94.4	0.16	0.88
114.52 dB	114.5	0.02	0.88

Select C Slow response

STD Setting	UUC Reading (dB)	Correction (dB)	Uncertainty of Measurement (± dB)
94.56 dB	94.5	0.06	0.88
114.52 dB	114.4	0.12	0.88

STD = Standard

UUC = Unit Under Calibration

- End of Certificate -



CERTIFICATE OF CALIBRATION

NO. 20231009167

Name of Product:	Sound Level Meter
Model:	ST-21D
Serial Number:	821042
Specification:	Class 2
Conclusion:	Pass
Date of calibration:	2023-10-18
Due Date:	2024-10-17

Calibrated by: 



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

1. Preliminary inspection: OK**2. Type & serial No. of Microphone:** AWA14421A-000606**4. Measuring up limit:** 138 dBA**3. Adjustments to indicated sound levels:****5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)**Type of Calibrator B&K 4231Sound Pressure Level 94.0 dBEquivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
20	-50.3	-6.3	-0.1	1000	0.1	0.0	0.0
31.5	-39.4	-2.9	-0.1	2000	1.4	-0.1	0.1
63	-26.1	-0.8	0.0	4000	1.3	-0.6	0.1
125	-16.1	-0.2	0.0	8000	-1.2	-3.1	0.1
250	-8.6	0.0	0.0	12500	-11.0	-13.0	0.0
500	-3.2	0.0	0.0	/	/	/	/

6. Self-generated noise

Microphone replaced by electrical input signal device

25.1 dB(A)	26.5 dB(C)	34.6 dB(Z)
------------	------------	------------

7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.0
Rate of the S weighting decrease (dB/s)	4.3
Deviation of F&S	-0.1

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

Reference sound level 90.0 dB

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

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

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

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

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB			
	L _A F _{max} -L _A	L _A S _{max} -L _A	L _A F-L _A	L _A eq,T-L _A
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-16.9	-6.9	-7.0
2	-18.2	-26.9	-26.9	-7.0
0.25	-27.1	/	-36.0	-7.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
L _C peak-L _C (dB)	3.5	3.5	2.3	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 123.0 dB

Sweep amplitude: 40 dB

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

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L _A eq,T	113.3	113.4	-0.1
L ₅	121.0	121.0	0.0
L ₁₀	119.0	119.0	0.0

L50	103.0	103.0	0.0
L90	87.1	87.0	0.1
L95	85.1	85.0	0.1

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

Environment conditions:

Air temperature: 25 °C

Relative humidity: 60 %

Static pressure: 101.8 kPa

References:

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

CERTIFICATE OF CALIBRATION

NO. 20240113131

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	820891
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-01-31
Due Date:	2025-01-29

Calibrated by:




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

1. Preliminary inspection: OK

 2. Type & serial No. of Microphone: AWA14425-57258

3. Adjustments to indicated sound levels:

 Type of Calibrator B&K 4231 Sound

 Pressure Level 94.0 dB

 4. Measuring up limit: 140 dBA

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

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

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-71.3	-14.5	-0.3	1000	0.0	0.0	-0.1
20	-50.1	-6.2	-0.1	2000	1.3	-0.1	-0.1
31.5	-39.2	-2.6	-0.1	4000	1.1	-0.9	-0.1
63	-26.1	-0.4	-0.2	8000	-1.0	-3.1	0.0
125	-16.2	-0.1	0.1	12500	-11.5	-13.5	0.1
250	-8.7	0.1	-0.1	16000	-11.5	-13.3	0.1
500	-3.1	0.2	-0.2	20000	-23.9	-25.9	-0.1

6. Self-generated noise

Microphone replaced by electrical input signal device

6.9 dB(A)	8.4 dB(C)	14.8 dB(Z)
-----------	-----------	------------

7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.1
Rate of the S weighting decrease (dB/s)	4.3
Deviation of F&S	-0.1

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

Reference sound level 90.0 dB

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

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

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

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

9. Tone burst response (A Weighting) :

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

10. Peak C sound level (500Hz) :

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

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

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

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

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

Environment conditions:

Air temperature: 20 °C

Relative humidity: 50 %

Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2024-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2024-10-15	CIGISMEC
Signal generator	DS 360	33873	2024-10-15	CEPREI

Test specifications:

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

References:

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

CERTIFICATE OF CALIBRATION

NO. 20240113135

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	820895
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-01-31
Due Date:	2025-01-29

Calibrated by:




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

1. Preliminary inspection: OK

 2. Type & serial No. of Microphone: AWA14425-52659

3. Adjustments to indicated sound levels:

 Type of Calibrator B&K 4231 Sound

 Pressure Level 94.0 dB

 4. Measuring up limit: 140 dBA

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

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

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-71.1	-14.3	-0.1	1000	0.0	0.0	-0.1
20	-50.2	-6.2	-0.2	2000	1.3	-0.1	-0.1
31.5	-39.2	-2.5	-0.1	4000	1.2	-0.8	-0.1
63	-26.1	-0.2	-0.1	8000	-1.0	-3.2	0.0
125	-16.2	-0.1	0.1	12500	-11.5	-13.5	0.1
250	-8.7	0.1	-0.1	16000	-11.4	-13.2	0.1
500	-3.3	0.1	-0.1	20000	-23.8	-25.8	-0.1

6. Self-generated noise

Microphone replaced by electrical input signal device

8.6 dB(A)	8.9 dB(C)	17.1 dB(Z)
-----------	-----------	------------

7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.1
Rate of the S weighting decrease (dB/s)	4.4
Deviation of F&S	-0.1

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

Reference sound level 90.0 dB

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

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

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

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

9. Tone burst response (A Weighting) :

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

10. Peak C sound level (500Hz) :

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

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

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

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

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

Environment conditions:

Air temperature: 20 °C

Relative humidity: 50 %

Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2024-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2024-10-15	CIGISMEC
Signal generator	DS 360	33873	2024-10-15	CEPREI

Test specifications:

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

References:

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

CERTIFICATE OF CALIBRATION

NO. 20240113128

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	820888
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-01-31
Due Date:	2025-01-29

Calibrated by:

Jim Lin



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

1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-39024

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231 Sound

Pressure Level 94.0 dB

4. Measuring up limit: 140 dBA

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

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

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-71.1	-14.2	-0.4	1000	0.0	0.1	-0.1
20	-50.1	-6.2	-0.2	2000	1.3	-0.2	-0.1
31.5	-39.2	-2.6	-0.1	4000	1.1	-0.5	-0.1
63	-26.1	-0.4	-0.1	8000	-1.0	-3.1	0.0
125	-16.2	-0.1	-0.1	12500	-11.5	-8.0	0.1
250	-8.6	0.1	-0.1	16000	-11.4	-13.8	0.1
500	-3.2	0.1	-0.2	20000	-23.8	-25.9	-0.1

6. Self-generated noise

Microphone replaced by electrical input signal device

9.1 dB(A)	9.4 dB(C)	17.1 dB(Z)
-----------	-----------	------------

7. F&S Weighting

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

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

Reference sound level 90.0 dB

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

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

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

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

9. Tone burst response (A Weighting) :

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

10. Peak C sound level (500Hz) :

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

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

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

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

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

Environment conditions:

Air temperature: 20 °C

Relative humidity: 50 %

Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2024-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2024-10-15	CIGISMEC
Signal generator	DS 360	33873	2024-10-15	CEPREI

Test specifications:

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

References:

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

CERTIFICATE OF CALIBRATION

NO. 20231214072

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	820265
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2023-12-14
Due Date:	2024-12-13

Calibrated by:

Jim Lin

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

1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-54838

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231 SoundPressure Level 94.0 dB4. Measuring up limit: 140 dBA

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

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

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-71.1	-14.6	0.2	1000	0.0	0.0	-0.1
20	-50.3	-6.1	-0.4	2000	1.2	-0.2	0.0
31.5	-39.6	-3.1	0.1	4000	1.0	-0.8	0.0
63	-26.3	-0.9	-0.1	8000	-1.2	-3.2	0.0
125	-16.2	-0.2	-0.2	12500	-5.8	-7.8	0.1
250	-8.7	0.0	0.0	16000	-11.7	-13.7	0.0
500	-3.2	0.0	0.0	20000	-23.8	-25.8	-0.2

6. Self-generated noise

Microphone replaced by electrical input signal device

7.6 dB(A)	11.0 dB(C)	18.9 dB(Z)
-----------	------------	------------

7. F&S Weighting

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

8. Level Linearity (A-weighting at frequency 1 kHz)Reference sound level 90.0 dBMax error at 10dB steps upper reference sound level 0.1 dBMax error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dBMax error at 10dB steps below reference sound level 0.1 dBMax error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB**9. Tone burst response (A Weighting) :**

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

10. Peak C sound level (500Hz) :

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

11. Overload indication: Pass**12. Statistical analysis function**Sweep signal maximum indicated sound level: 112.8 dBSweep amplitude: 40 dBScan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L _{Aeq,T}	103.2	103.2	0.0
L ₅	110.8	110.8	0.0
L ₁₀	108.8	108.8	0.0
L ₅₀	92.9	92.8	0.1
L ₉₀	76.9	76.8	0.1
L ₉₅	75.0	74.9	0.1

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

Environment conditions:

Air temperature: 20 °C

Relative humidity: 50 %

Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2024-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2024-10-15	CIGISMEC
Signal generator	DS 360	33873	2024-10-15	CEPREI

Test specifications:

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

References:

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

CERTIFICATE OF CALIBRATION

NO. 20240113138

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	820898
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2024-01-31
Due Date:	2025-01-29

Calibrated by:

Jim Lin



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

1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14425-58918

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231 Sound

Pressure Level 94.0 dB

4. Measuring up limit: 140 dBA

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

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

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-71.2	-14.1	-0.3	1000	0.0	0.0	-0.1
20	-50.1	-6.2	-0.1	2000	1.3	-0.1	-0.1
31.5	-39.2	-2.3	-0.1	4000	1.2	-0.8	-0.1
63	-26.1	-0.1	-0.1	8000	-1.0	-3.2	0.0
125	-16.2	-0.2	0.1	12500	-11.5	-13.5	0.1
250	-8.6	0.1	-0.1	16000	-11.3	-13.1	0.1
500	-3.2	0.1	-0.1	20000	-23.9	-25.9	-0.1

6. Self-generated noise

Microphone replaced by electrical input signal device

10.3 dB(A)	11.6 dB(C)	18.6 dB(Z)
------------	------------	------------

7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.1
Rate of the S weighting decrease (dB/s)	4.3
Deviation of F&S	-0.1

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

Reference sound level 90.0 dB

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

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

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

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

9. Tone burst response (A Weighting) :

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

10. Peak C sound level (500Hz) :

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

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

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

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

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

Environment conditions:

Air temperature: 20 °C

Relative humidity: 50 %

Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description:	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2929405	2024-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2024-10-15	CIGISMEC
Signal generator	DS 360	33873	2024-10-15	CEPREI

Test specifications:

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

References:

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



SMILE
Laboratory Co., Ltd.

บริษัท สไมล์ แล็บอราทอรี จำกัด

Smile Laboratory Co., Ltd.

563/1 ถนนเทอดไท แขวงบางหว้า เขตภาษีเจริญ กรุงเทพฯ 10160 โทรศัพท์ 02-227-0265 โทรสาร 02-454-0317

563/1 Thoei Thai Rd., Bangwa, Phasicharoen, Bangkok 10160 Tel. 02-227-0265 Fax. 02-454-0317

TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information

Sampler Location	บริษัท อิตาเลียนไทย ดีเวลอปเม้นท์ จำกัด (มหาชน)	Date	21 February 2024
Project Site	พื้นที่โครงการ	Person	Mr. Warakorn Charoenkhun

Calibration Orifice

Transfer Standard Type	Orifice	Q _{std} Slope (m)	2.10372
Calibrator Model	TE-5025A	Q _{std} Intercept (b)	-0.03890
Calibrator Serial Number	3092		

Calibration Information

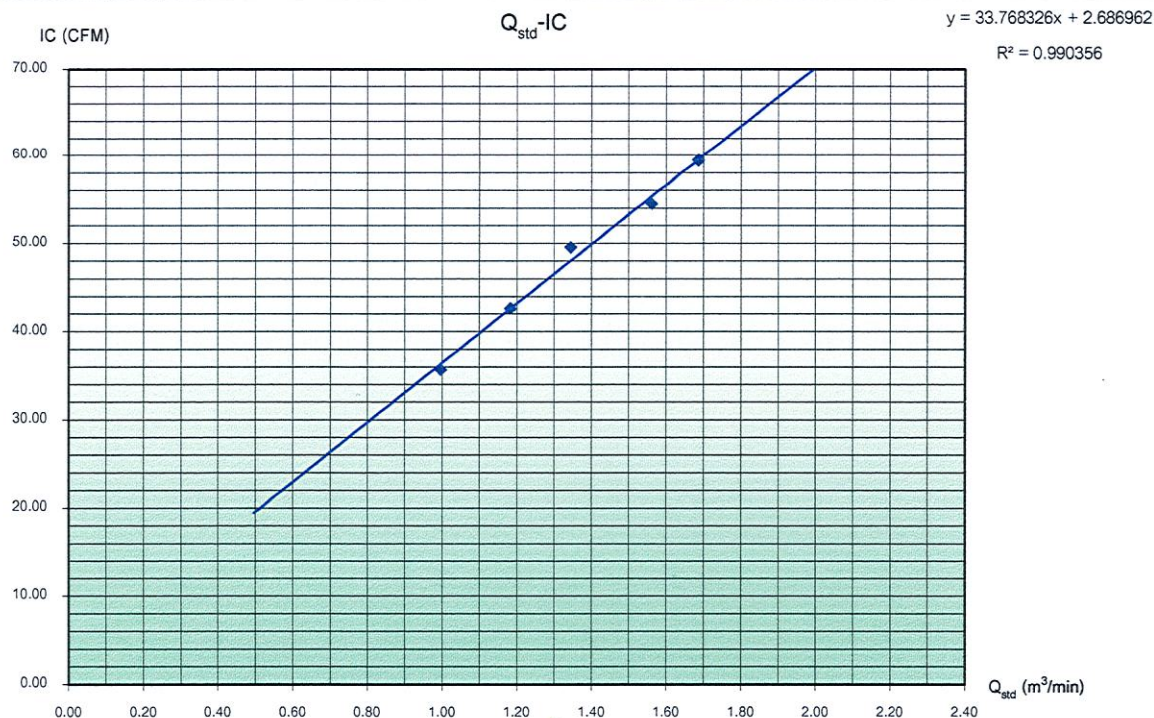
Sampler Number	TSP No.01	Motor Serial Number	1203-415	Recorder Serial Number	596
----------------	-----------	---------------------	----------	------------------------	-----

Test No.	Pressure Drop Across Orifice (ΔH ₂ O) (inH ₂ O)			(A)	(X)	(I)	(Y)	Temperature (°K = °C+273)	Barometric Pressure (mmHg)
	Positive	Negative	ΔH ₂ O	[ΔH ₂ O(P _a /P _{std})(T _{std} /T _a)] ^{1/2}	Q _{std} = (1/m)[(A-b)] (m ³ /min)	Sample Flow Rate Indication (ft ³ /min)	IC = I[(P _a /P _{std})(T _{std} /T _a)] ^{1/2} (ft ³ /min)		
1	2.2	2.1	4.30	2.05646	0.99603	36.0	35.70	303.0	760.0
2	3.2	2.9	6.10	2.44936	1.18279	43.0	42.64	303.0	760.0
3	4.1	3.8	7.90	2.78741	1.34348	50.0	49.59	303.0	760.0
4	5.4	5.3	10.70	3.24398	1.56051	55.0	54.54	303.0	760.0
5	6.3	6.2	12.50	3.50624	1.68518	60.0	59.50	303.0	760.0
Average								303.0	760.0

Linear Regression : y= mX + b

Slope (m)	33.768326
Intercept (b)	2.686962
R-Square (R ²)	0.990356
Correlation Coefficient (r)	0.995166

Andersen Instruments, Inc.



Calibrated By

Warakorn
Mr. Warakorn Charoenkhun

SMILE
Laboratory Co., Ltd.



SMILE
Laboratory Co., Ltd.

บริษัท สไมล์ แล็บอราทอรี จำกัด

Smile Laboratory Co., Ltd.

563/1 ถนนทองเอก แขวงบางท่าว เขตป้อมปราบศัตรูพ่าย กรุงเทพมหานคร 10160 โทรศัพท์ 02-227-0265 โทรสาร 02-454-0317

563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok 10160 Tel. 02-227-0265 Fax. 02-454-0317

PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information

Sampler Location	บริษัท อิตาเลียนไทย ดีเวลอปเม้นท์ จำกัด (มหาชน)	Date	21 February 2024
Project Site	พื้นที่โครงการ	Person	Mr. Warakorn Charoenkhun

Calibration Orifice

Transfer Standard Type	Orifice	Q_{std} Slope (m)	2.10372
Calibrator Model	TE-5025A	Q_{std} Intercept (b)	-0.03890
Calibrator Serial Number	3092		

Calibration Information

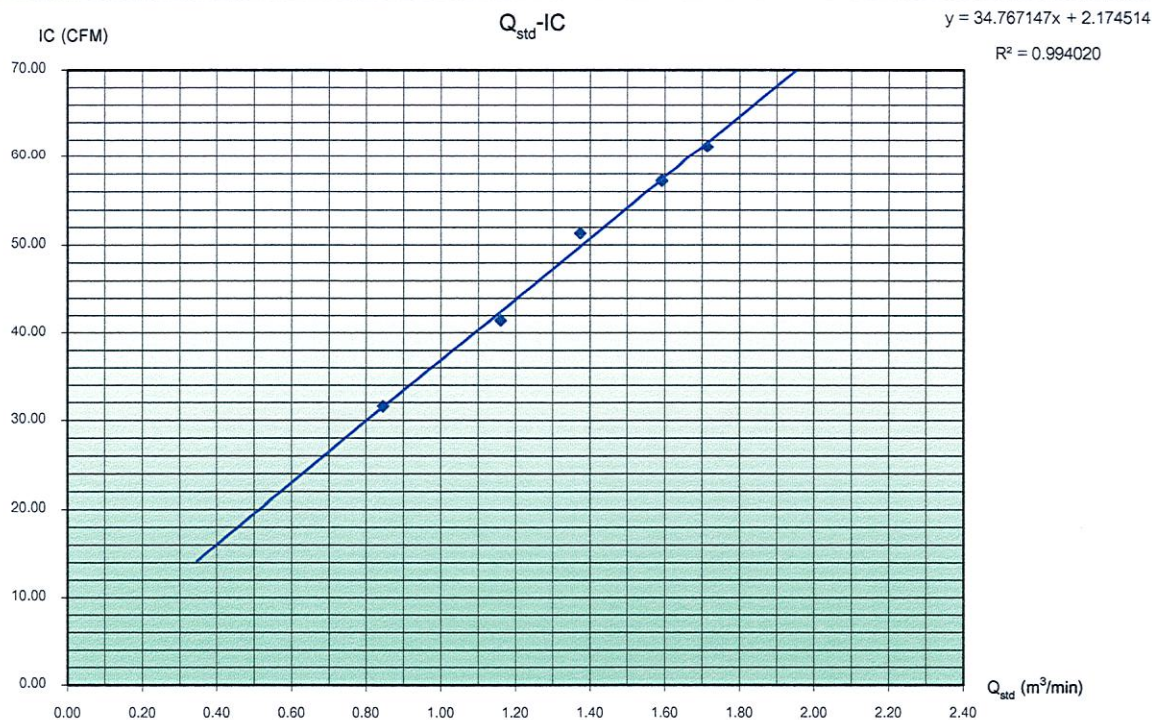
Sampler Number	PM10 No.01	Motor Serial Number	1203-440	Recorder Serial Number	604
----------------	------------	---------------------	----------	------------------------	-----

Test No.	Pressure Drop Across Orifice (ΔH_2O) (in H_2O)			(A)	(X)	(I)	(Y)	Temperature ($^{\circ}K = ^{\circ}C + 273$)	Barometric Pressure (mmHg)
	Positive	Negative	ΔH_2O	$[\Delta H_2O(P_a/P_{std})(T_{std}/T_a)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m^3/min)	Sample Flow Rate Indication (ft^3/min)	$IC = [(P_a/P_{std})(T_{std}/T_a)]^{1/2}$ (ft^3/min)		
1	1.6	1.5	3.10	1.74036	0.84577	32.0	31.63	305.0	760.0
2	3.0	2.9	5.90	2.40096	1.15978	42.0	41.52	305.0	760.0
3	4.2	4.1	8.30	2.84772	1.37215	52.0	51.40	305.0	760.0
4	5.7	5.5	11.20	3.30801	1.59095	58.0	57.33	305.0	760.0
5	6.6	6.4	13.00	3.56394	1.71260	62.0	61.28	305.0	760.0
Average								305.0	760.0

Linear Regression : $y = mX + b$

Slope (m)	34.767147
Intercept (b)	2.174514
R-Square (R^2)	0.994020
Correlation Coefficient (r)	0.997006

Andersen Instruments, Inc.



Calibrated By

จรัญกร
Mr. Warakorn Charoenkhun

SMILE
Laboratory Co., Ltd.



SMILE
Laboratory Co., Ltd.

บริษัท สไมล์ แล็บอราทอรี จำกัด

Smile Laboratory Co., Ltd.

563/1 ถนนทองเอก แขวงบางท้วม เขตภาษีเจริญ กรุงเทพมหานคร 10160 โทรศัพท์ 02-227-0265 โทรสาร 02-454-0317
563/1 Thoei Thai Rd., Bangwa, Phasicharoen, Bangkok 10160 Tel. 02-227-0265 Fax. 02-454-0317

TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information

Sampler Location	บริษัท อิตาเลียนไทย ดีเวลอปเม้นท์ จำกัด (มหาชน)	Date	21 February 2024
Project Site	สุสานไทยสมบุรณ์ (ชุมชนบ้านมาบใหญ่)	Person	Mr. Warakorn Charoenkhun

Calibration Orifice

Transfer Standard Type	Orifice	Q_{std} Slope (m)	2.10372
Calibrator Model	TE-5025A	Q_{std} Intercept (b)	-0.03890
Calibrator Serial Number	3092		

Calibration Information

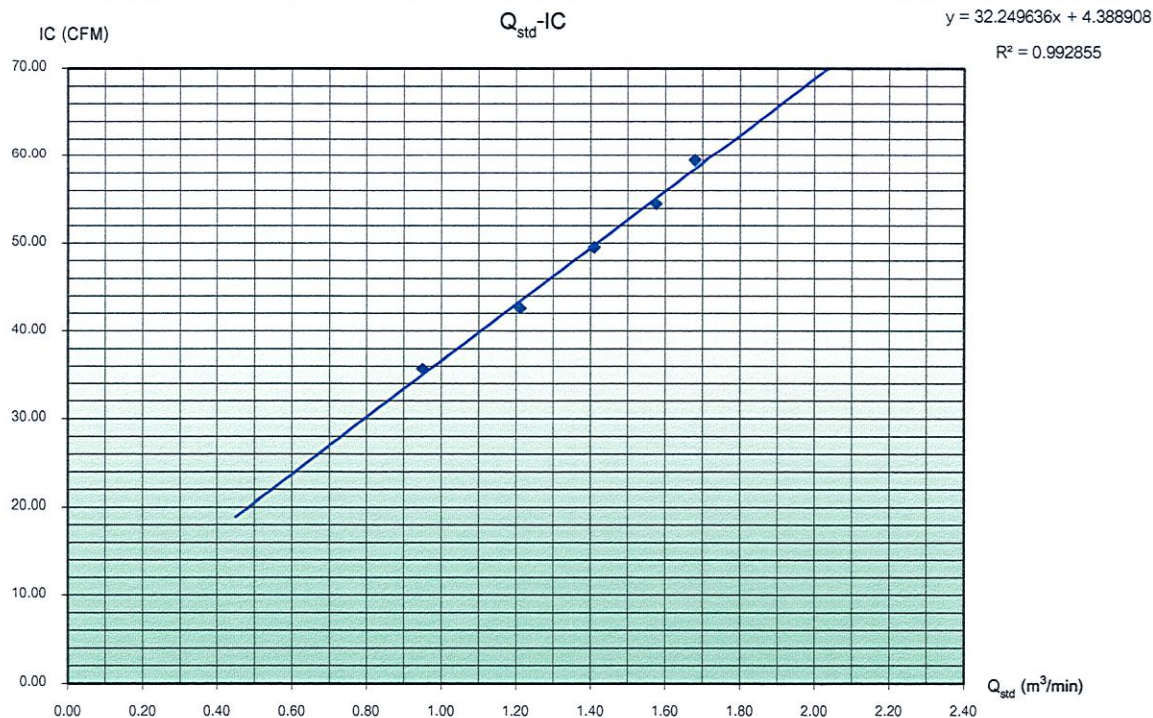
Sampler Number	TSP No.03	Motor Serial Number	1203-426	Recorder Serial Number	600
----------------	-----------	---------------------	----------	------------------------	-----

Test No.	Pressure Drop Across Orifice (ΔH_2O) (in H_2O)			(A)	(X)	(I)	(Y)	Temperature ($^{\circ}K = ^{\circ}C + 273$)	Barometric Pressure (mmHg)
	Positive	Negative	ΔH_2O	$[\Delta H_2O(P_a/P_{std})(T_{std}/T_a)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m^3/min)	Sample Flow Rate Indication (ft^3/min)	$IC = I[(P_a/P_{std})(T_{std}/T_a)]^{1/2}$ (ft^3/min)		
1	2.0	1.9	3.90	1.95848	0.94945	36.0	35.70	303.0	760.0
2	3.3	3.1	6.40	2.50886	1.21107	43.0	42.64	303.0	760.0
3	4.4	4.3	8.70	2.92514	1.40895	50.0	49.59	303.0	760.0
4	5.5	5.4	10.90	3.27416	1.57486	55.0	54.54	303.0	760.0
5	6.3	6.1	12.40	3.49219	1.67850	60.0	59.50	303.0	760.0
Average								303.0	760.0

Linear Regression : $y = mX + b$

Slope (m)	32.249636
Intercept (b)	4.388908
R-Square (R^2)	0.992855
Correlation Coefficient (r)	0.996421

Andersen Instruments, Inc.



Calibrated By

วรากรณ์

Mr. Warakorn Charoenkhun

SMILE
Laboratory Co., Ltd.



SMILE
Laboratory Co., Ltd.

บริษัท สไมล์ แล็บอราทอรี จำกัด

Smile Laboratory Co., Ltd.

563/1 ถนนทองหล่อ แขวงบางนา เขตภาษีเจริญ กรุงเทพฯ 10160 โทรศัพท์ 02-227-0265 โทรสาร 02-454-0317

563/1 Thoei Thal Rd., Bangwa, Phasicharoen, Bangkok 10160 Tel. 02-227-0265 Fax. 02-454-0317

PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information

Sampler Location	บริษัท อิตาเลียนไทย ดีเวลอปเม้นท์ จำกัด (มหาชน)	Date	21 February 2024
Project Site	สุสานไทยสมุทร (ชุมชนบ้านมาบใหญ่)	Person	Mr. Warakorn Charoengkun

Calibration Orifice

Transfer Standard Type	Orifice	Q_{std} Slope (m)	2.10372
Calibrator Model	TE-5025A	Q_{std} Intercept (b)	-0.03890
Calibrator Serial Number	3092		

Calibration Information

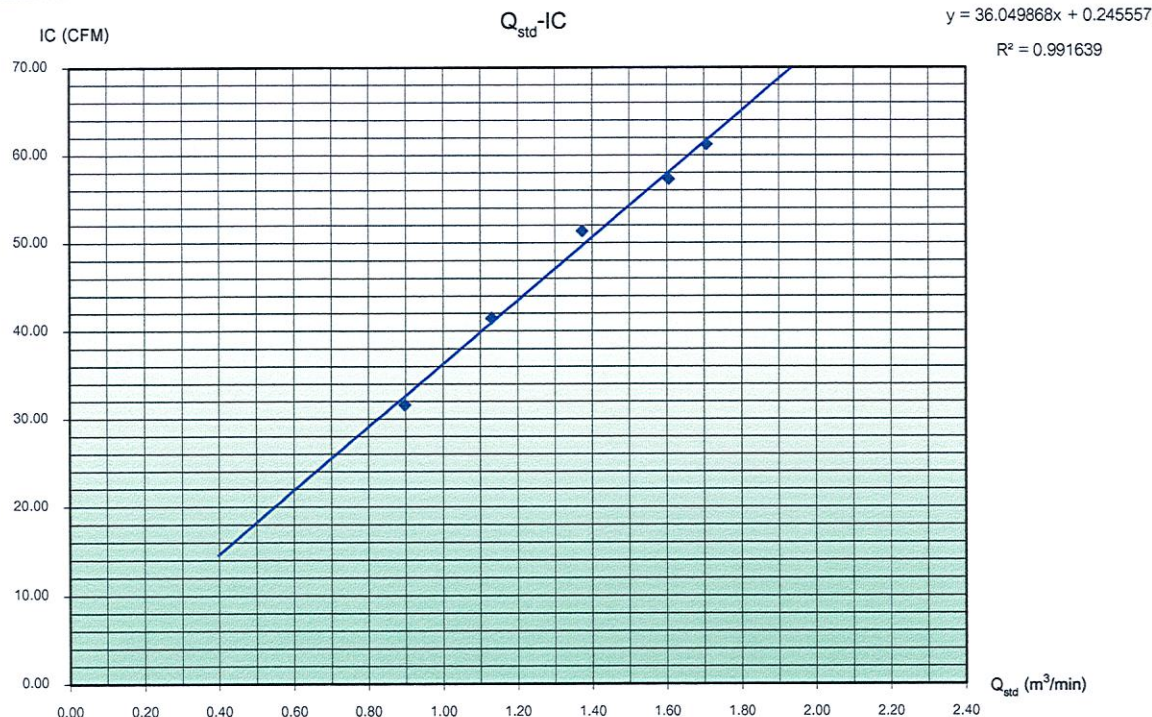
Sampler Number	PM10 No.03	Motor Serial Number	1203-449	Recorder Serial Number	608
----------------	------------	---------------------	----------	------------------------	-----

Test No.	Pressure Drop Across Orifice (ΔH_2O) (in H_2O)			(A)	(X)	(I)	(Y)	Temperature ($^{\circ}K = ^{\circ}C + 273$)	Barometric Pressure (mmHg)
	Positive	Negative	ΔH_2O	$[\Delta H_2O(P_a/P_{std})(T_{std}/T_a)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m^3/min)	Sample Flow Rate Indication (ft ³ /min)	$IC = I[(P_a/P_{std})(T_{std}/T_a)]^{1/2}$ (ft ³ /min)		
1	1.8	1.7	3.50	1.84924	0.89752	32.0	31.63	305.0	760.0
2	2.9	2.7	5.60	2.33912	1.13039	42.0	41.52	305.0	760.0
3	4.2	4.1	8.30	2.84772	1.37215	52.0	51.40	305.0	760.0
4	5.8	5.6	11.40	3.33742	1.60493	58.0	57.33	305.0	760.0
5	6.5	6.4	12.90	3.55020	1.70607	62.0	61.28	305.0	760.0
Average								305.0	760.0

Linear Regression : $y = mX + b$

Slope (m)	36.049868
Intercept (b)	0.245557
R-Square (R^2)	0.991639
Correlation Coefficient (r)	0.995811

Andersen Instruments, Inc.



Calibrated By

อรรถกร

Mr. Warakorn Charoengkun

SMILE
Laboratory Co., Ltd.



บริษัท สไมล์ แล็บอราทอรี จำกัด

Smile Laboratory Co., Ltd.

563/1 ถนนทองหล่อ แขวงบางกะปิ เขตปทุมธานี กรุงเทพมหานคร 10160 โทรศัพท์ 02-227-0265 โทรสาร 02-454-0317
563/1 Thoei Thai Rd., Bangwa, Phasicharoen, Bangkok 10160 Tel. 02-227-0265 Fax. 02-454-0317

TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information

Sampler Location	บริษัท อิตาเลียนไทย ดีเวลอปเม้นท์ จำกัด (มหาชน)	Date	21 February 2024
Project Site	ศาลเจ้าข้าไทจื้อ	Person	Mr. Warakorn Charoenkhun

Calibration Orifice

Transfer Standard Type	Orifice	Q_{std} Slope (m)	2.10372
Calibrator Model	TE-5025A	Q_{std} Intercept (b)	-0.03890
Calibrator Serial Number	3092		

Calibration Information

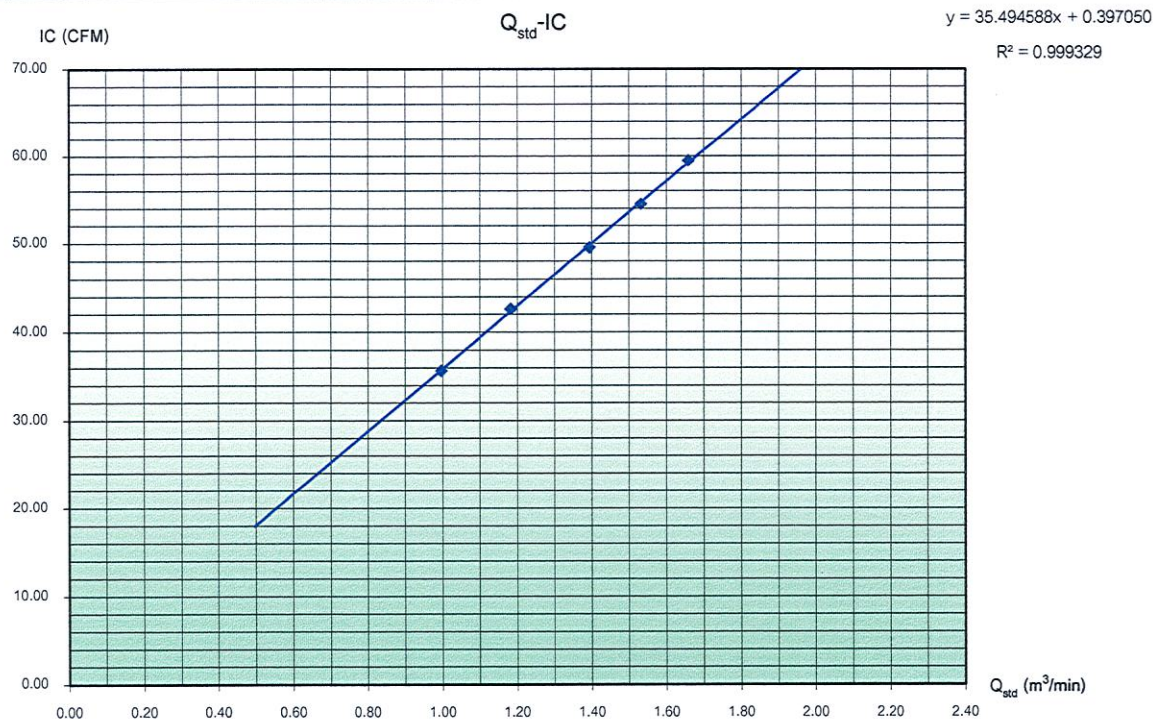
Sampler Number	TSP No.02	Motor Serial Number	1203-421	Recorder Serial Number	598
----------------	-----------	---------------------	----------	------------------------	-----

Test No.	Pressure Drop Across Orifice (ΔH_2O) (inH ₂ O)			(A)	(X)	(I)	(Y)	Temperature (°K = °C+273)	Barometric Pressure (mmHg)
	Positive	Negative	ΔH_2O	$[\Delta H_2O(P_a/P_{std})(T_{std}/T_a)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m ³ /min)	Sample Flow Rate Indication (ft ³ /min)	$IC = I[(P_a/P_{std})(T_{std}/T_a)]^{1/2}$ (ft ³ /min)		
1	2.2	2.1	4.30	2.05646	0.99603	36.0	35.70	303.0	760.0
2	3.1	3.0	6.10	2.44936	1.18279	43.0	42.64	303.0	760.0
3	4.3	4.2	8.50	2.89132	1.39288	50.0	49.59	303.0	760.0
4	5.2	5.1	10.30	3.18277	1.53142	55.0	54.54	303.0	760.0
5	6.1	6.0	12.10	3.44969	1.65829	60.0	59.50	303.0	760.0
Average								303.0	760.0

Linear Regression : $y = mX + b$

Slope (m)	35.494588
Intercept (b)	0.397050
R-Square (R^2)	0.999329
Correlation Coefficient (r)	0.999664

Andersen Instruments, Inc.



Calibrated By

วรากรณ์

Mr. Warakorn Charoenkhun

SMILE
Laboratory Co., Ltd.



บริษัท สไมล์ แล็บอราทอรี จำกัด

Smile Laboratory Co., Ltd.

563/1 ถนนพหลโยธิน แขวงบางกะปิ เขตปทุมธานี กรุงเทพฯ 10160 โทรศัพท์ 02-227-0265 โทรสาร 02-454-0317
563/1 Thoei Thai Rd., Bangwa, Phasicharoen, Bangkok 10160 Tel. 02-227-0265 Fax. 02-454-0317

PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information

Sampler Location	บริษัท อิตาเลียนไทย ดีเวลอปเม้นท์ จำกัด (มหาชน)	Date	21 February 2024
Project Site	ศาลเจ้าซาโหจิ	Person	Mr. Warakorn Charoenkhun

Calibration Orifice

Transfer Standard Type	Orifice	Q _{std} Slope (m)	2.10372
Calibrator Model	TE-5025A	Q _{std} Intercept (b)	-0.03890
Calibrator Serial Number	3092		

Calibration Information

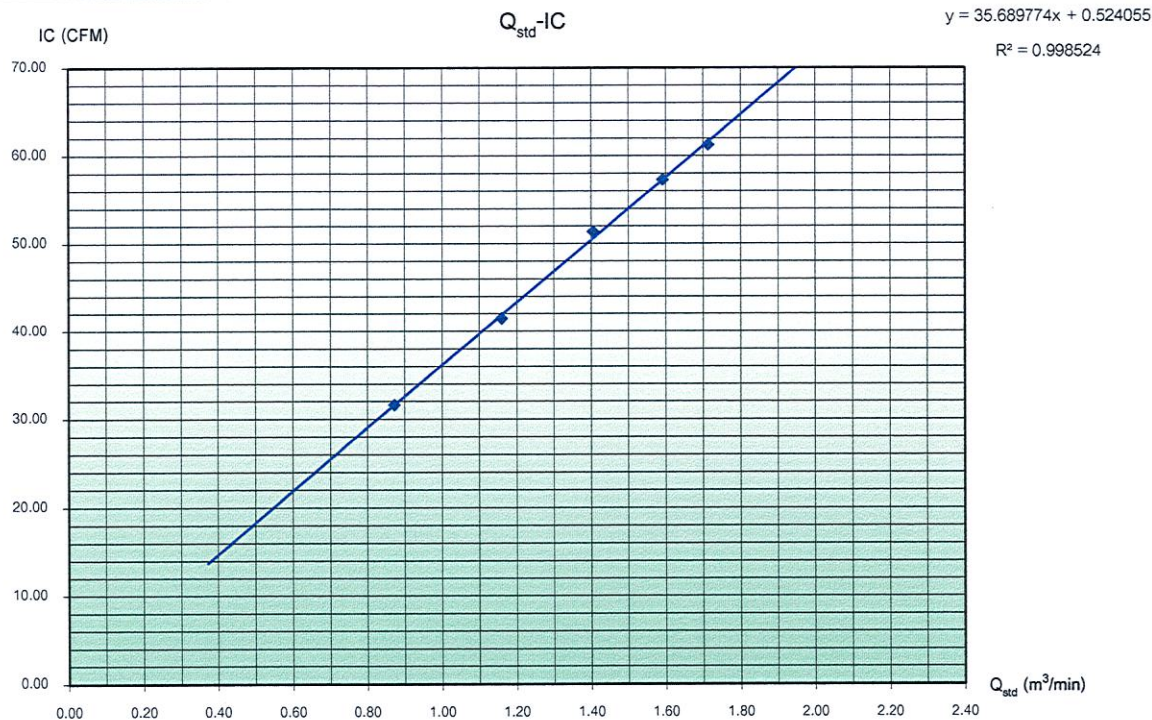
Sampler Number	PM10 No.02	Motor Serial Number	1203-444	Recorder Serial Number	606
----------------	------------	---------------------	----------	------------------------	-----

Test No.	Pressure Drop Across Orifice (ΔH ₂ O) (inH ₂ O)			(A)	(X)	(I)	(Y)	Temperature (*K = *C+273)	Barometric Pressure (mmHg)
	Positive	Negative	ΔH ₂ O	[ΔH ₂ O(P _a /P _{std})(T _{std} /T _a)] ^{1/2}	Q _{std} = (1/m)[(A-b)] (m ³ /min)	Sample Flow Rate Indication (ft ³ /min)	IC = I[(P _a /P _{std})(T _{std} /T _a)] ^{1/2} (ft ³ /min)		
1	1.7	1.6	3.30	1.79562	0.87204	32.0	31.63	305.0	760.0
2	3.0	2.9	5.90	2.40096	1.15978	42.0	41.52	305.0	760.0
3	4.4	4.3	8.70	2.91553	1.40438	52.0	51.40	305.0	760.0
4	5.7	5.5	11.20	3.30801	1.59095	58.0	57.33	305.0	760.0
5	6.6	6.4	13.00	3.56394	1.71260	62.0	61.28	305.0	760.0
Average								305.0	760.0

Linear Regression : y= mX + b

Slope (m)	35.689774
Intercept (b)	0.524055
R-Square (R ²)	0.998524
Correlation Coefficient (r)	0.999262

Andersen Instruments, Inc.



Calibrated By

วรากรณ์

Mr. Warakorn Charoenkhun

SMILE
Laboratory Co., Ltd.



บริษัท สไมล์ แล็บอราทอรี จำกัด

Smile Laboratory Co., Ltd.

563/1 ถนนทองหล่อ แขวงบางกะปิ เขตปทุมวัน กรุงเทพฯ 10160 โทรศัพท์ 02-227-0265 โทรสาร 02-454-0317
563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok 10160 Tel. 02-227-0265 Fax. 02-454-0317

TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information

Sampler Location	บริษัท อิตาเลียนไทย ดีเวลอปเม้นท์ จำกัด (มหาชน)	Date	21 February 2024
Project Site	สุสานสุขสันต์สุขาวดี	Person	Mr. Warakorn Charoenkhun

Calibration Orifice

Transfer Standard Type	Orifice	Q _{std} Slope (m)	2.10372
Calibrator Model	TE-5025A	Q _{std} Intercept (b)	-0.03890
Calibrator Serial Number	3092		

Calibration Information

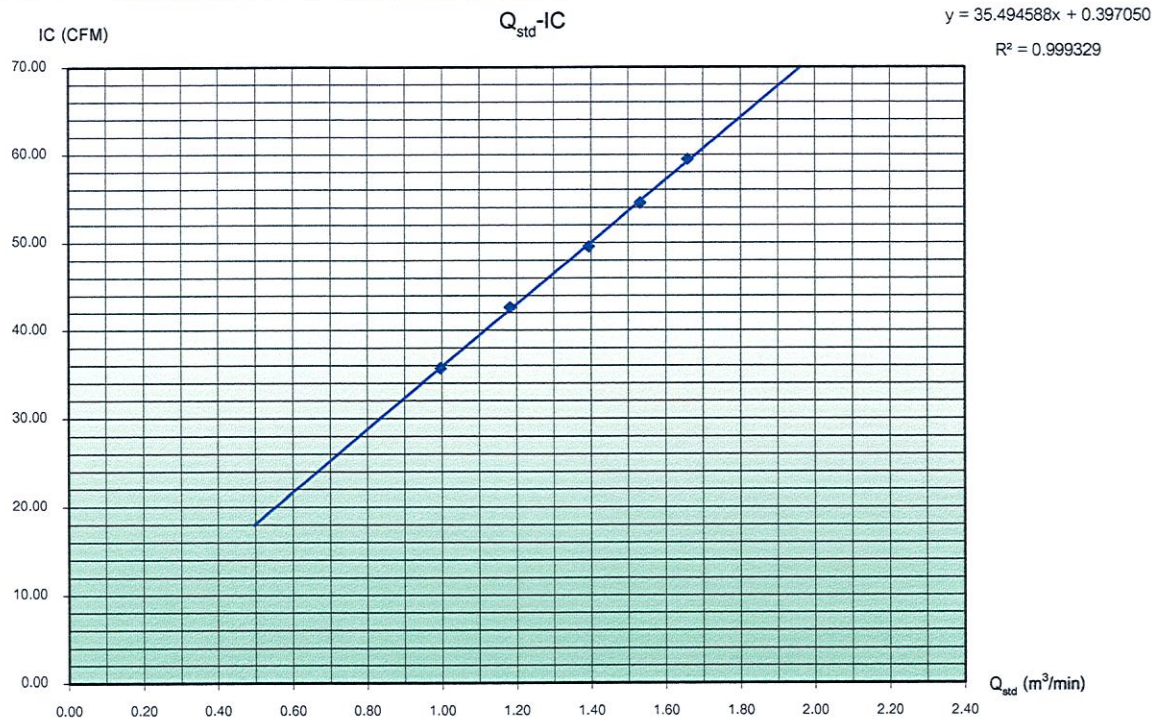
Sampler Number	TSP No.05	Motor Serial Number	1203-422	Recorder Serial Number	599
----------------	-----------	---------------------	----------	------------------------	-----

Test No.	Pressure Drop Across Orifice (ΔH ₂ O) (inH ₂ O)			(A)	(X)	(I)	(Y)	Temperature	Barometric Pressure
	Positive	Negative	ΔH ₂ O	$[\Delta H_2O(P_a/P_{std})(T_{std}/T_a)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m ³ /min)	Sample Flow Rate Indication (ft ³ /min)	$IC = I[(P_a/P_{std})(T_{std}/T_a)]^{1/2}$ (ft ³ /min)	(°K = °C+273)	(mmHg)
1	2.2	2.1	4.30	2.05646	0.99603	36.0	35.70	303.0	760.0
2	3.1	3.0	6.10	2.44936	1.18279	43.0	42.64	303.0	760.0
3	4.3	4.2	8.50	2.89132	1.39288	50.0	49.59	303.0	760.0
4	5.2	5.1	10.30	3.18277	1.53142	55.0	54.54	303.0	760.0
5	6.1	6.0	12.10	3.44969	1.65829	60.0	59.50	303.0	760.0
Average								303.0	760.0

Linear Regression : y= mX + b

Slope (m)	35.494588
Intercept (b)	0.397050
R-Square (R ²)	0.999329
Correlation Coefficient (r)	0.999664

Andersen Instruments, Inc.



Calibrated By

วรากรณ์

Mr. Warakorn Charoenkhun

SMILE
Laboratory Co., Ltd.



SMILE
Laboratory Co., Ltd.

บริษัท สไมล์ แล็บอราทอรี จำกัด

Smile Laboratory Co., Ltd.

563/1 ถนนทองหล่อ แขวงบางท้วม เขตภาษีเจริญ กรุงเทพฯ 10160 โทรศัพท์ 02-227-0265 โทรสาร 02-454-0317
563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok 10160 Tel. 02-227-0265 Fax. 02-454-0317

PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information

Sampler Location	บริษัท อิตาเลียนไทย ดีเวลอปเม้นท์ จำกัด (มหาชน)	Date	21 February 2024
Project Site	สุสานสุขสันต์สุขาวดี	Person	Mr. Warakorn Charoenkhun

Calibration Orifice

Transfer Standard Type	Orifice	Q _{std} Slope (m)	2.10372
Calibrator Model	TE-5025A	Q _{std} Intercept (b)	-0.03890
Calibrator Serial Number	3092		

Calibration Information

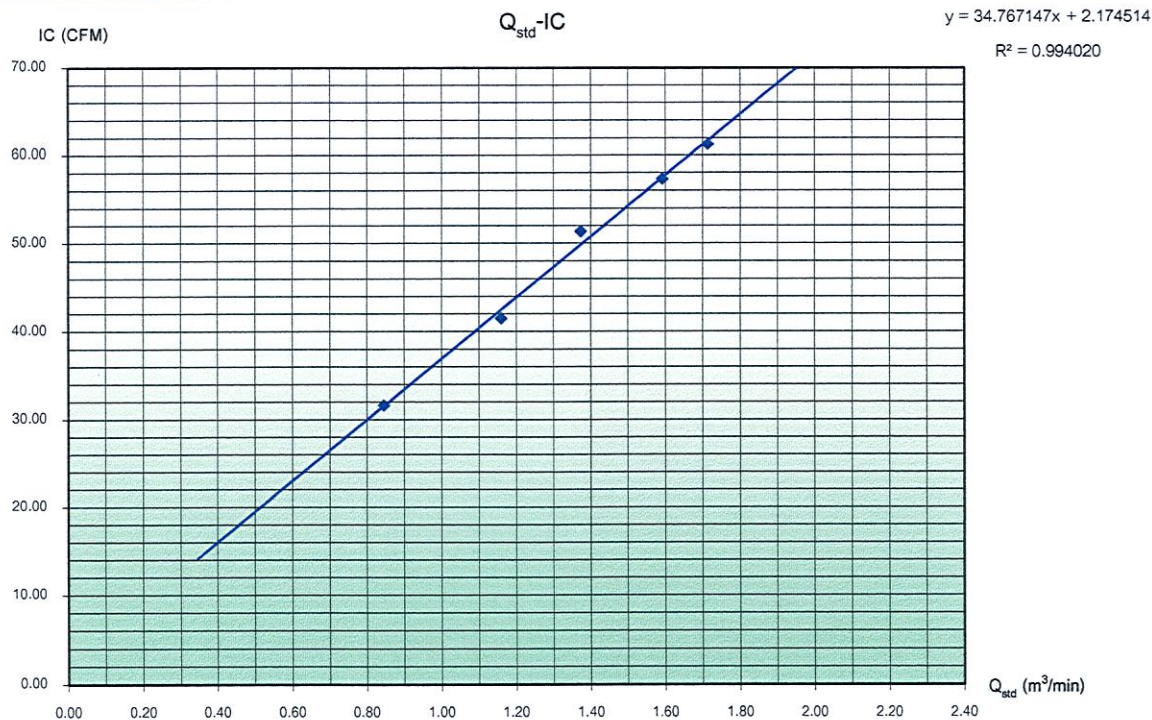
Sampler Number	PM10 No.05	Motor Serial Number	1203-447	Recorder Serial Number	605
----------------	------------	---------------------	----------	------------------------	-----

Test No.	Pressure Drop Across Orifice (ΔH ₂ O) (inH ₂ O)			(A)	(X)	(I)	(Y)	Temperature (°K = °C+273)	Barometric Pressure (mmHg)
	Positive	Negative	ΔH ₂ O	[ΔH ₂ O(P _a /P _{std})(T _{std} /T _a)] ^{1/2}	Q _{std} = (1/m)[(A-b)] (m ³ /min)	Sample Flow Rate Indication (ft ³ /min)	IC = I[(P _a /P _{std})(T _{std} /T _a)] ^{1/2} (ft ³ /min)		
1	1.6	1.5	3.10	1.74036	0.84577	32.0	31.63	305.0	760.0
2	3.0	2.9	5.90	2.40096	1.15978	42.0	41.52	305.0	760.0
3	4.2	4.1	8.30	2.84772	1.37215	52.0	51.40	305.0	760.0
4	5.7	5.5	11.20	3.30801	1.59095	58.0	57.33	305.0	760.0
5	6.6	6.4	13.00	3.56394	1.71260	62.0	61.28	305.0	760.0
Average								305.0	760.0

Linear Regression : y= mX + b

Slope (m)	34.767147
Intercept (b)	2.174514
R-Square (R ²)	0.994020
Correlation Coefficient (r)	0.997006

Andersen Instruments, Inc.



Calibrated By

วรากรณ์

Mr. Warakorn Charoenkhun

SMILE
Laboratory Co., Ltd.



บริษัท สไมล์ แล็บอราทอรี จำกัด

Smile Laboratory Co., Ltd.

563/1 ถนนทองหล่อ แขวงบางหว้า เขตภาษีเจริญ กรุงเทพฯ 10160 โทรศัพท์ 02-227-0265 โทรสาร 02-454-0317
563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok 10160 Tel. 02-227-0265 Fax. 02-454-0317

TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information

Sampler Location	บริษัท อิตาเลียนไทย ดีเวลอปเม้นท์ จำกัด (มหาชน)	Date	21 February 2024
Project Site	บ้านราษฎร์ที่ใกล้เคียง พื้นที่หิวดะวันตก	Person	Mr. Warakorn Charoenkhun

Calibration Orifice

Transfer Standard Type	Orifice	Q_{std} Slope (m)	2.10372
Calibrator Model	TE-5025A	Q_{std} Intercept (b)	-0.03890
Calibrator Serial Number	3092		

Calibration Information

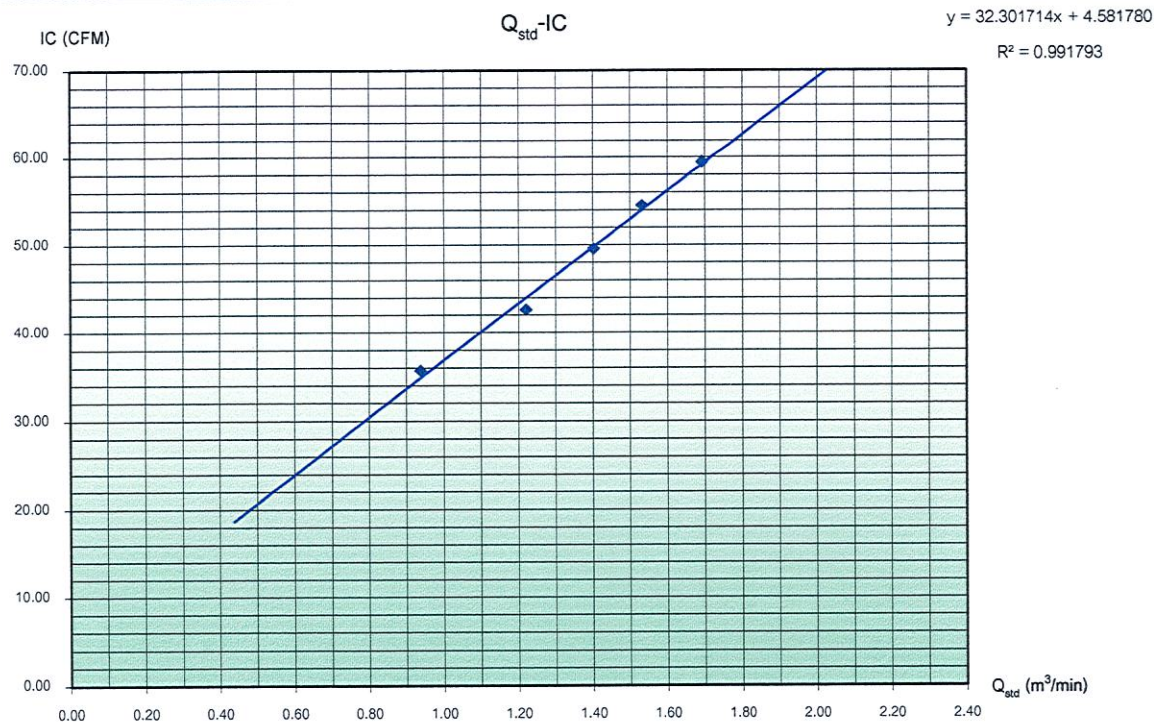
Sampler Number	TSP No.04	Motor Serial Number	1203-432	Recorder Serial Number	602
----------------	-----------	---------------------	----------	------------------------	-----

Test No.	Pressure Drop Across Orifice (ΔH_2O) (in H_2O)			(A)	(X)	(I)	(Y)	Temperature ($^{\circ}K = ^{\circ}C + 273$)	Barometric Pressure (mmHg)
	Positive	Negative	ΔH_2O	$[\Delta H_2O(P_a/P_{std})(T_{std}/T_a)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m^3/min)	Sample Flow Rate Indication (ft^3/min)	$IC = I[(P_a/P_{std})(T_{std}/T_a)]^{1/2}$ (ft^3/min)		
1	1.9	1.9	3.80	1.93321	0.93744	36.0	35.70	303.0	760.0
2	3.3	3.2	6.50	2.52839	1.22036	43.0	42.64	303.0	760.0
3	4.4	4.2	8.60	2.90828	1.40094	50.0	49.59	303.0	760.0
4	5.2	5.1	10.30	3.18277	1.53142	55.0	54.54	303.0	760.0
5	6.4	6.2	12.60	3.52024	1.69183	60.0	59.50	303.0	760.0
Average								303.0	760.0

Linear Regression : $y = mX + b$

Slope (m)	32.301714
Intercept (b)	4.581780
R-Square (R^2)	0.991793
Correlation Coefficient (r)	0.995888

Andersen Instruments, Inc.



Calibrated By

Warakorn
Mr. Warakorn Charoenkhun

SMILE
Laboratory Co., Ltd.



บริษัท สไมล์ แล็บอราทอรี จำกัด

Smile Laboratory Co., Ltd.

563/1 ถนนทองหล่อ แขวงบางท้วม เขตภาษีเจริญ กรุงเทพฯ 10160 โทรศัพท์ 02-227-0265 โทรสาร 02-454-0317
563/1 Thoe Thai Rd., Bangwa, Phasicharoen, Bangkok 10160 Tel. 02-227-0265 Fax. 02-454-0317

PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information

Sampler Location	บริษัท อิตาเลียนไทย ดีเวลอปเม้นท์ จำกัด (มหาชน)	Date	21 February 2024
Project Site	บ้านราษฎร์ไถ่เลี้ยง พื้นที่ทิศตะวันตก	Person	Mr. Warakorn Charoenkhun

Calibration Orifice

Transfer Standard Type	Orifice	Q_{std} Slope (m)	2.10372
Calibrator Model	TE-5025A	Q_{std} Intercept (b)	-0.03890
Calibrator Serial Number	3092		

Calibration Information

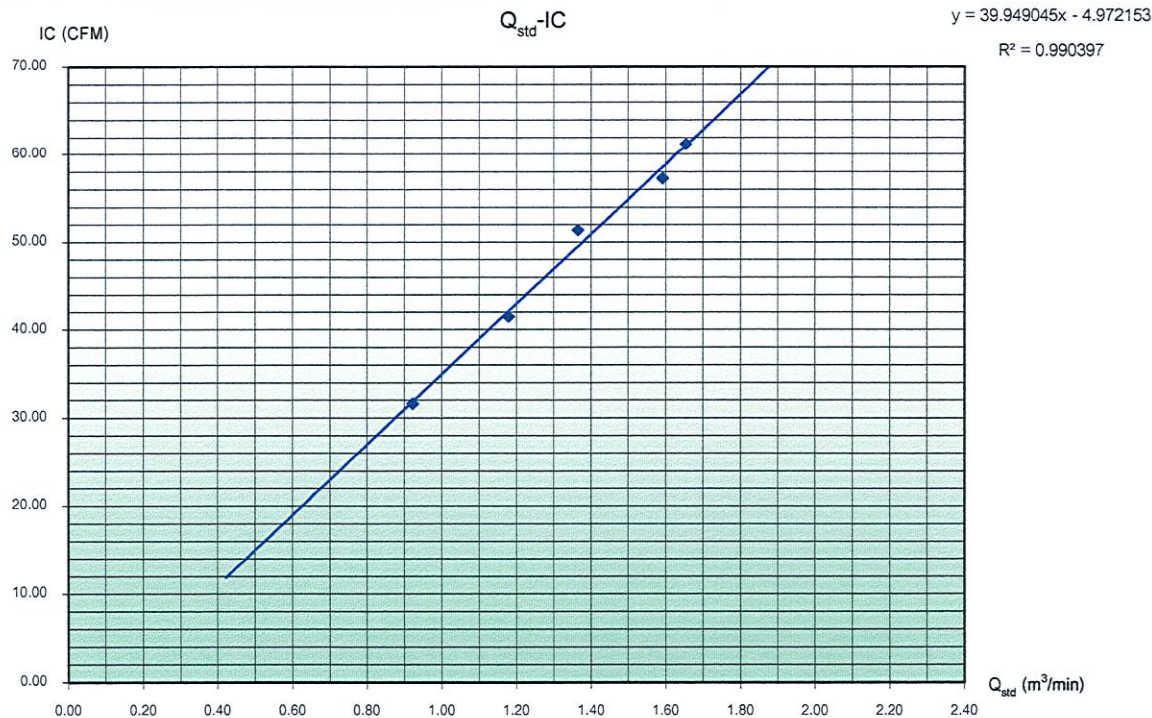
Sampler Number	PM10 No.04	Motor Serial Number	1203-453	Recorder Serial Number	610
----------------	------------	---------------------	----------	------------------------	-----

Test No.	Pressure Drop Across Orifice (ΔH_2O) (in H_2O)			(A)	(X)	(I)	(Y)	Temperature ($^{\circ}K = ^{\circ}C + 273$)	Barometric Pressure (mmHg)
	Positive	Negative	ΔH_2O	$[\Delta H_2O(P_a/P_{std})(T_{std}/T_a)]^{1/2}$	$Q_{std} = (1/m)[(A-b)]$ (m^3/min)	Sample Flow Rate Indication (ft^3/min)	$IC = I[(P_a/P_{std})(T_{std}/T_a)]^{1/2}$ (ft^3/min)		
1	1.9	1.8	3.70	1.90134	0.92229	32.0	31.63	305.0	760.0
2	3.1	3.0	6.10	2.44131	1.17896	42.0	41.52	305.0	760.0
3	4.2	4.0	8.20	2.83051	1.36397	52.0	51.40	305.0	760.0
4	5.7	5.5	11.20	3.30801	1.59095	58.0	57.33	305.0	760.0
5	6.1	6.0	12.10	3.43836	1.65291	62.0	61.28	305.0	760.0
Average								305.0	760.0

Linear Regression : $y = mX + b$

Slope (m)	39.949045
Intercept (b)	4.972153
R-Square (R^2)	0.990397
Correlation Coefficient (r)	0.995187

Andersen Instruments, Inc.



Calibrated By

วรากรณ์

Mr. Warakorn Charoenkhun

SMILE
Laboratory Co., Ltd.

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 21 January 2024

Certificate No. 123/21

Page : 1 of 2

Manufacture Yong Instruments

Type four blade helicoid propeller

Model No. 05103

Mfg Code Logger 30908233

Transmitter -

Customer ENVIR SERVICE CO., LTD.

42 Raminthra 14 yeak 9, Tha Raeng,

Bangkhen, Bangkok 10230

Calibration Condition : Temperature 25.2 °C

Barometric Pressure 1012.8 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

STANDARD THERMOMETER : Theodor Friedrich : Dry No. 8390/94 Wet No. 8389/94

: Thermoschneider No. 918802

STANDARD BAROMETER : Digital Barometer Vaisala Type RTB220 No. V1220015

Calibrated by :



Mr. Pasagorn Samol

The Result of Calibration

Date of Issue 21 January 2024

Certificate No. 123/21

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO 1425			TESTED ANEMOMETER			
	Pressure inches	Vacuum inches	Pressure hPa	Pressure hPa	Correction hPa	Velocity m/sec	Correction m/sec
1.00	-	-	-	-	-	0.7	0.30
3.02	-	-	-	-	-	2.7	0.32
5.04	-	-	-	-	-	4.7	0.34
7.03	-	-	-	-	-	6.7	0.33
9.01	-	-	-	-	-	8.5	0.51
11.03	-	-	-	-	-	10.7	0.33
13.01	-	-	-	-	-	12.4	0.61
15.03	-	-	-	-	-	14.1	0.93
17.05	-	-	-	-	-	16.4	0.65
20.02	-	-	-	-	-	19.1	0.92

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

Calibrated by :



Mr. Pasagorn Samol

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 21 January 2024

Certificate No. 124/21

Page : 1 of 2

Manufacture Yong Instruments

Type four blade helicoid propeller

Model No. 05103

Mfg Code Logger 30908695

Transmitter -

Customer ENVIR SERVICE CO., LTD.

42 Raminthra 14 yeak 9, Tha Raeng,

Bangkhen, Bangkok 10230

Calibration Condition : Temperature 25.2 °C

Barometric Pressure 1012.8 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

STANDARD THERMOMETER : Theodor Friedrich : Dry No. 8390/94 Wet No. 8389/94

: Thermoschneider No. 918802

STANDARD BAROMETER : Digital Barometer Vaisaia Type RTB220 No. V1220015

Calibrated by :



Mr. Pasagorn Samol

The Result of Calibration

Date of Issue 21 January 2024

Certificate No. 124/21

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO 1425			TESTED ANEMOMETER			
	Pressure inches	Vacuum inches	Pressure hPa	Pressure hPa	Correction hPa	Velocity m/sec	Correction m/sec
1.00	-	-	-	-	-	0.7	0.30
3.02	-	-	-	-	-	2.7	0.32
5.04	-	-	-	-	-	4.7	0.34
7.03	-	-	-	-	-	6.7	0.33
9.01	-	-	-	-	-	8.5	0.51
11.03	-	-	-	-	-	10.7	0.33
13.01	-	-	-	-	-	12.4	0.61
15.03	-	-	-	-	-	14.1	0.93
17.05	-	-	-	-	-	16.4	0.65
20.02	-	-	-	-	-	19.1	0.92

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

Calibrated by :



Mr. Pasagorn Samol

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 21 January 2024

Certificate No. 122/21

Page : 1 of 2

Manufacture Yong Instruments

Type four blade helicoid propeller

Model No. 05103

Mfg Code Logger 30908794

Transmitter -

Customer ENVIR SERVICE CO., LTD.

42 Raminthra 14 yeak 9, Tha Raeng,

Bangkhen, Bangkok 10230

Calibration Condition : Temperature 25.2 °C

Barometric Pressure 1012.8 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

STANDARD THERMOMETER : Theodor Friedrich : Dry No. 8390/94 Wet No. 8389/94

: Thermoschneider No. 918802

STANDARD BAROMETER : Digital Barometer Vaisala Type RTB220 No. V1220015

Calibrated by :



Mr. Pasagorn Samol

The Result of Calibration

Date of Issue 21 January 2024

Certificate No. 122/21

Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO 1425			TESTED ANEMOMETER			
	Pressure inches	Vacuum inches	Pressure hPa	Pressure hPa	Correction hPa	Velocity m/sec	Correction m/sec
1.00	-	-	-	-	-	0.7	0.30
3.02	-	-	-	-	-	2.7	0.32
5.04	-	-	-	-	-	4.5	0.54
7.03	-	-	-	-	-	6.7	0.33
9.01	-	-	-	-	-	8.5	0.51
11.03	-	-	-	-	-	10.7	0.33
13.01	-	-	-	-	-	12.4	0.61
15.03	-	-	-	-	-	14.1	0.93
17.05	-	-	-	-	-	16.4	0.65
20.02	-	-	-	-	-	19.1	0.92

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

Calibrated by :



Mr. Pasagorn Samol

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 13 May 2023

Certificate No. 114/21

Page : 1 of 2

Manufacture Yong Instruments

Type four blade helicoid propeller

Model No. 05103

Mfg Code Logger 309020206

Transmitter -

Customer ENVIR SERVICE CO., LTD.

42 Raminthra 14 yeak 9, Tha Raeng,

Bangkhen, Bangkok 10230

Calibration Condition : Temperature 25.2 °C

Barometric Pressure 1012.8 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

STANDARD THERMOMETER : Theodor Friedrich : Dry No. 8390/94 Wet No. 8389/94

: Thermoschneider No. 918802

STANDARD BAROMETER : Digital Barometer Vaisaia Type RTB220 No. V1220015

Calibrated by :



Mr. Pasagorn Samol

The Result of Calibration

Date of Issue 13 May 2023

Certificate No. 114/21

Page : 2 of 2

Standard	HOOK GAGE NO 1425			TESTED ANEMOMETER			
	Pressure	Vacuum	Pressure	Pressure	Correction	Velocity	Correction
Ultrasonic Anemometer m/sec	inches	inches	hPa	hPa	hPa	m/sec	m/sec
1.00	-	-	-	-	-	0.7	0.30
3.02	-	-	-	-	-	2.7	0.32
5.04	-	-	-	-	-	4.8	0.24
7.03	-	-	-	-	-	6.7	0.33
9.01	-	-	-	-	-	8.7	0.31
11.03	-	-	-	-	-	10.7	0.33
13.01	-	-	-	-	-	12.4	0.61
15.03	-	-	-	-	-	14.1	0.93
17.05	-	-	-	-	-	16.4	0.65
20.02	-	-	-	-	-	19.1	0.92

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

Calibrated by :



Mr. Pasagorn Samol

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 9 May 2023

Certificate No. 241/21

Page : 1 of 2

Manufacture NRG Instruments

Type 3 Cup Anemometer

Model No. 40C

Mfg Code Logger 309012581

Transmitter -

Customer ENVIR SERVICE CO., LTD.

42 Raminthra 14 yeak 9, Tha Raeng,

Bangkhen, Bangkok 10230

Calibration Condition : Temperature 25.2 °C Barometric Pressure 1012.8 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

STANDARD THERMOMETER : Theodor Friedrich : Dry No. 8390/94 Wet No. 8389/94

: Thermoschneider No. 918802

STANDARD BAROMETER : Digital Barometer Vaisaia Type RTB220 No. V1220015

Calibrated by :



Mr. Pasagorn Samol

The Result of Calibration

Date of Issue 9 May 2023

Certificate No. 241/21

Page : 2 of 2

Standard	HOOK GAGE NO 1425			TESTED ANEMOMETER			
	Pressure	Vacuum	Pressure	Pressure	Correction	Velocity	Correction
Ultrasonic Anemometer m/sec	inches	inches	hPa	hPa	hPa	m/sec	m/sec
1.00	-	-	-	-	-	0.9	0.10
3.02	-	-	-	-	-	2.9	0.12
5.04	-	-	-	-	-	4.8	0.24
7.03	-	-	-	-	-	6.9	0.13
9.01	-	-	-	-	-	8.7	0.31
11.03	-	-	-	-	-	10.7	0.33
13.01	-	-	-	-	-	12.5	0.51
15.03	-	-	-	-	-	14.1	0.93
17.05	-	-	-	-	-	16.4	0.65
20.02	-	-	-	-	-	19.1	0.92

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

Calibrated by :



Mr. Pasagorn Samol

Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM22376

Calibration Date: JAN 19 2024

Calibration Reference Equipment: 714J7402

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

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

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

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

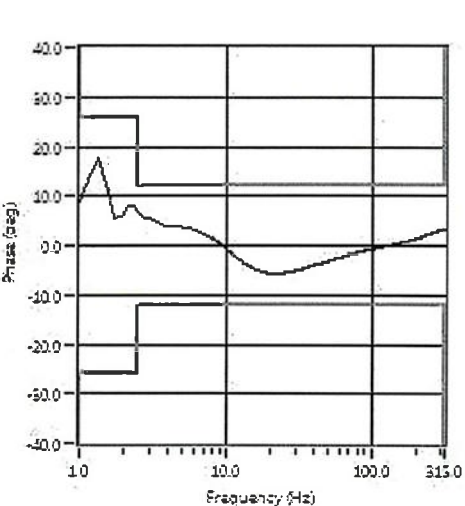
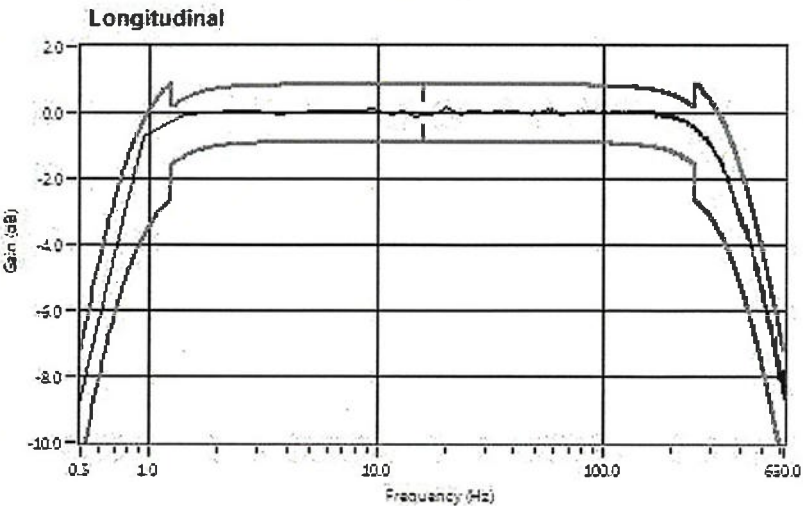
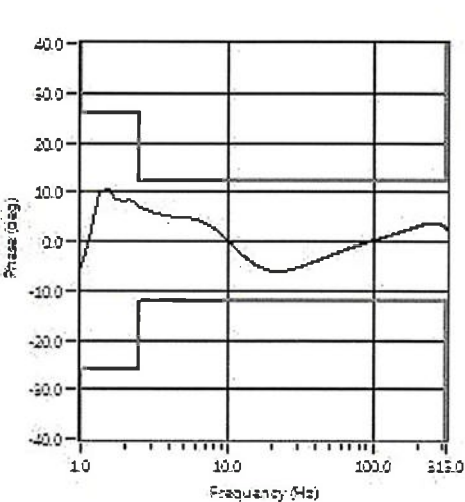
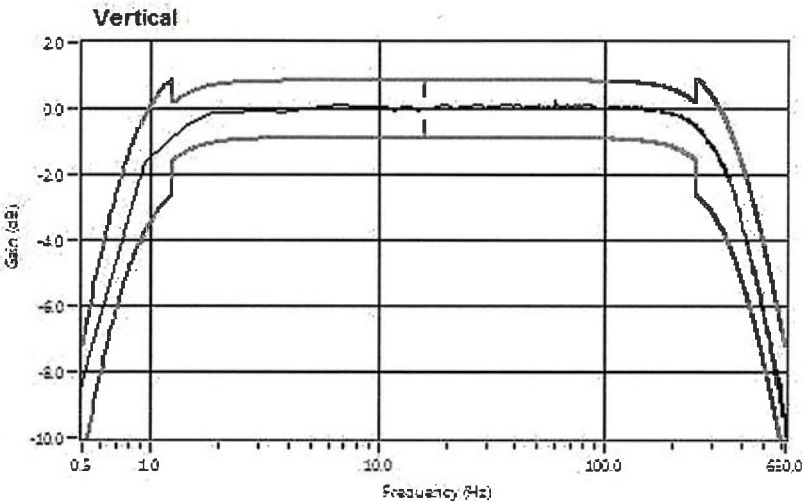
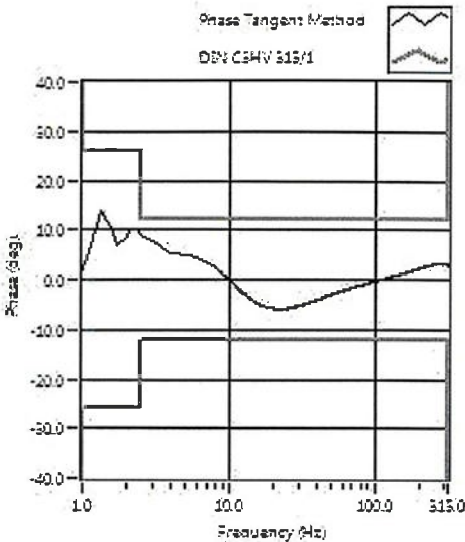
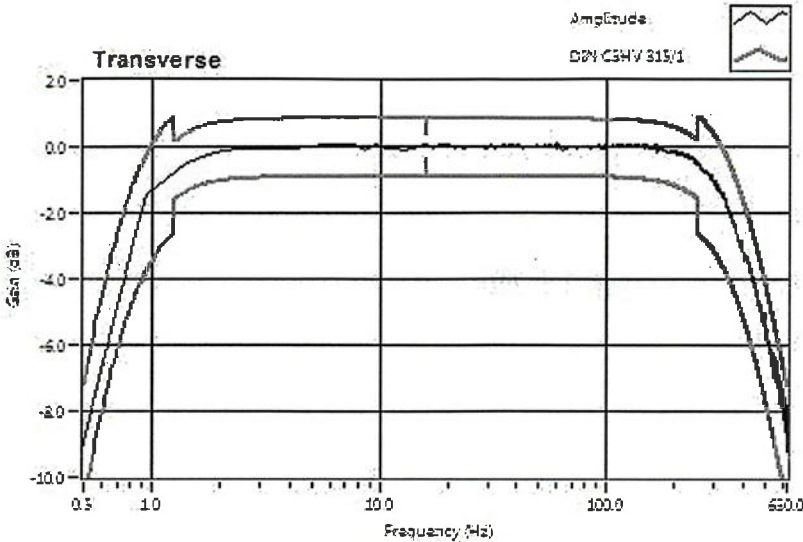
Calibrated By: _____

Xiaoming Yang



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

Frequency Response of UM22376



Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM22200

Calibration Date: **NOV 17 2023**

Calibration Reference Equipment: 714J7402

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

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

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

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

Calibrated By: _____

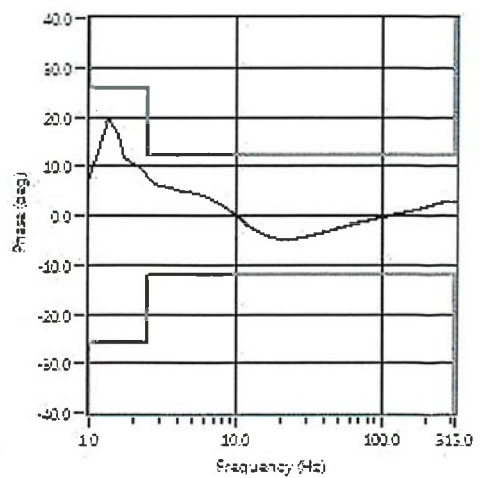
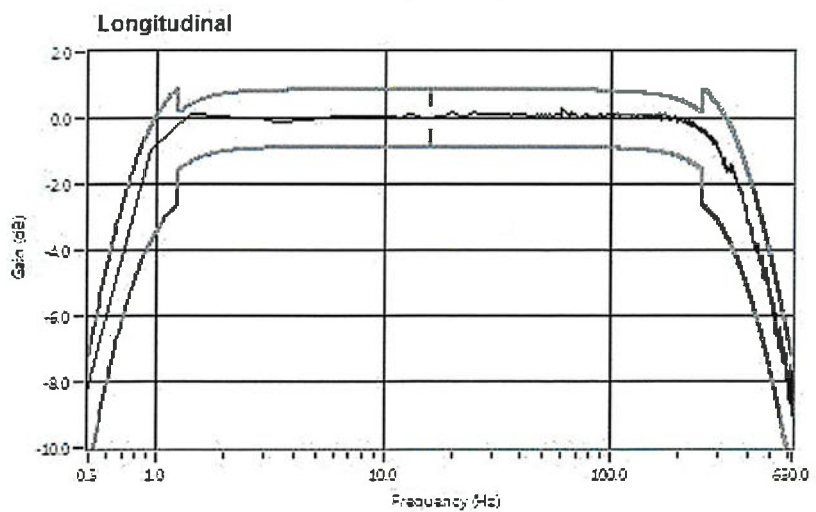
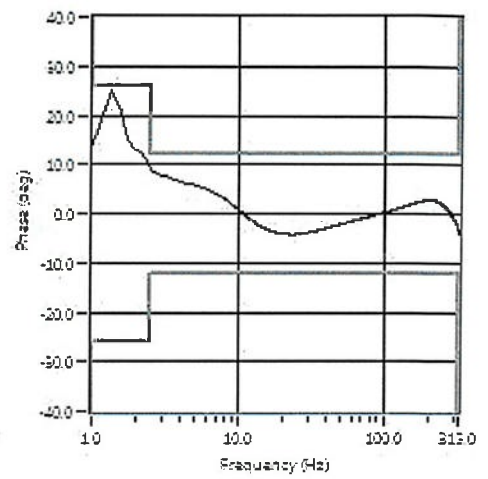
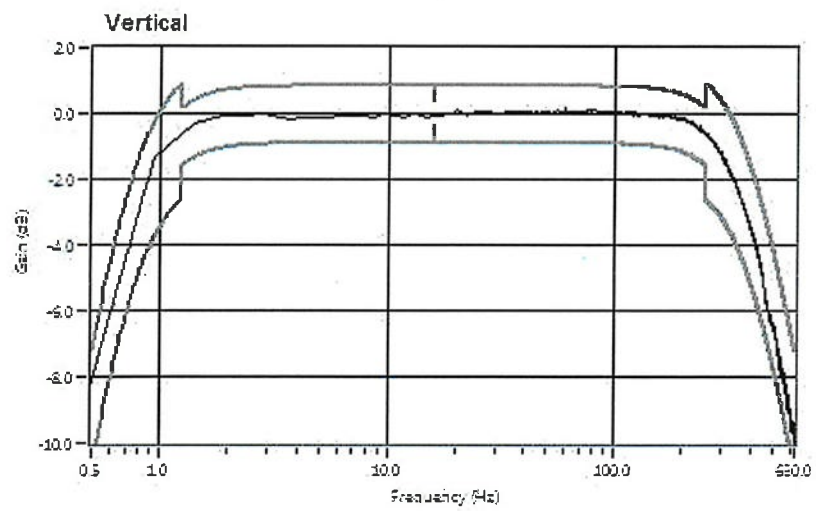
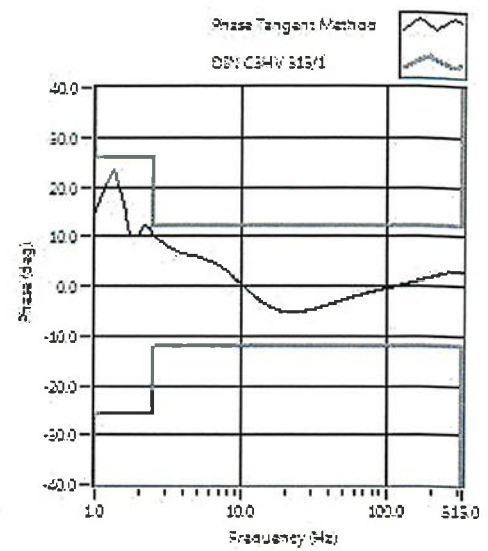
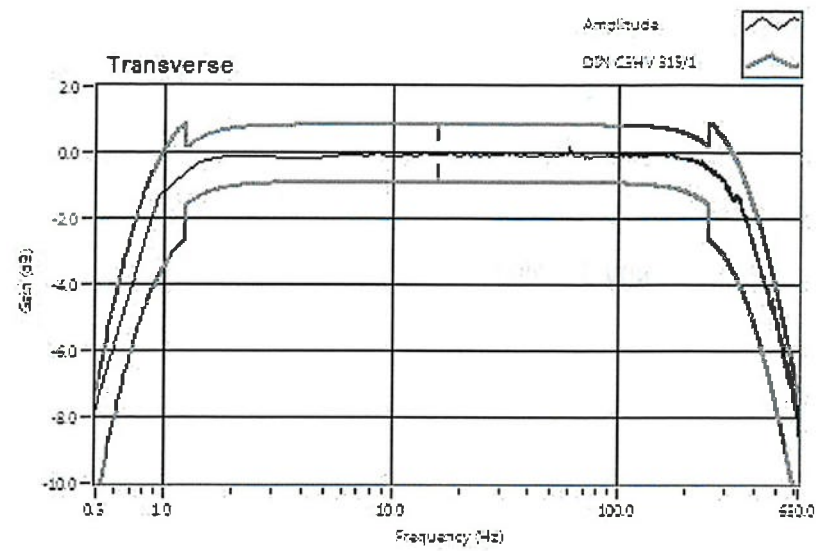
Xiaoming Yang



Instantel®

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

Frequency Response of UM22200



Calibration Certificate

Part Number: 721A2601
Description: Micromate with DIN Geophone
Serial Number: UM21456
Calibration Date: **MAR 17 2023**
Calibration Reference Equipment: 714J7403

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

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

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

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

Calibrated By: _____



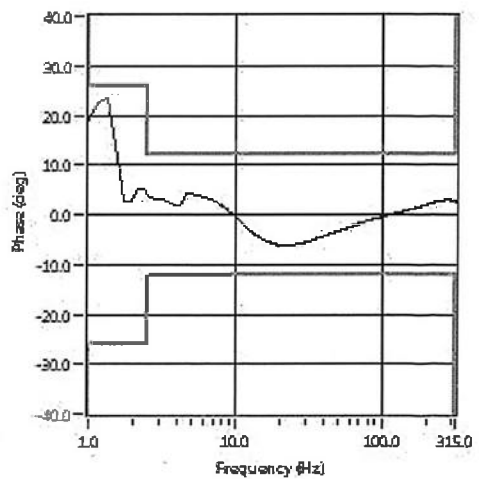
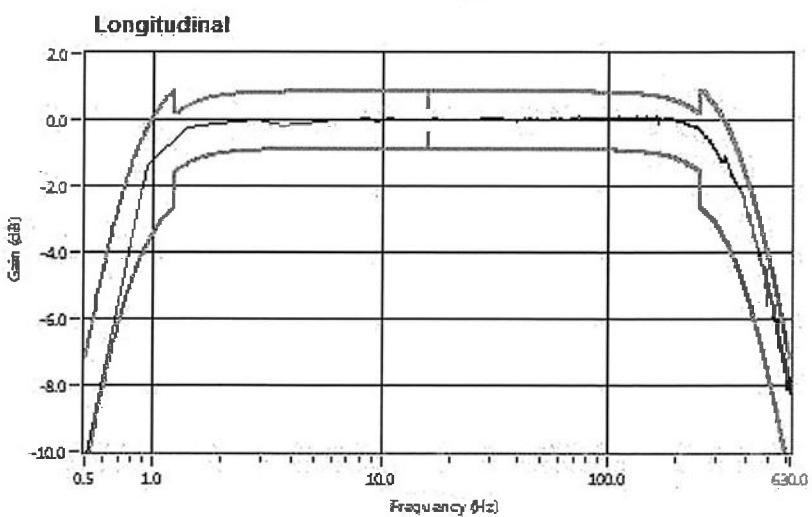
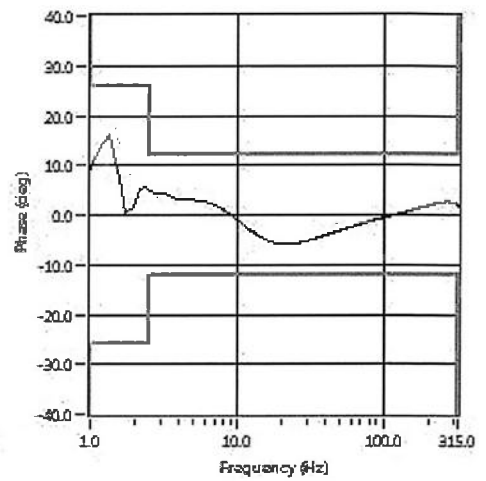
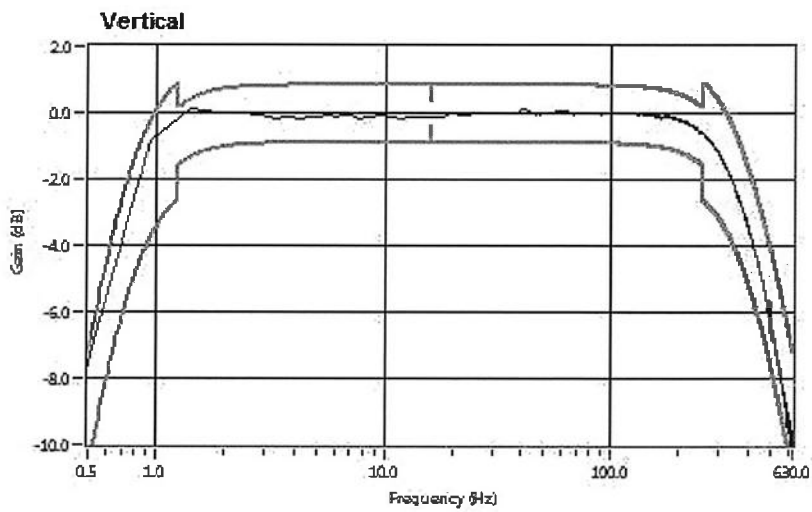
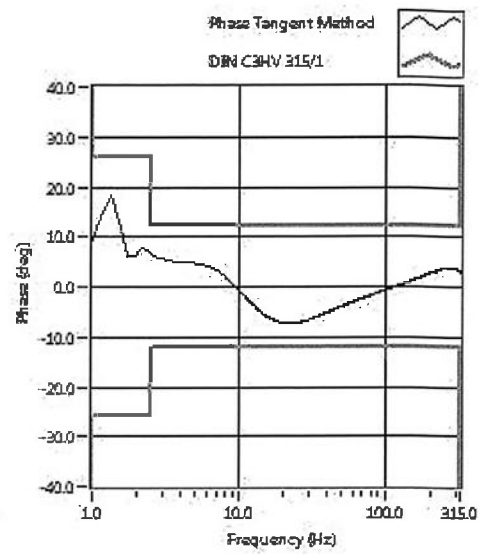
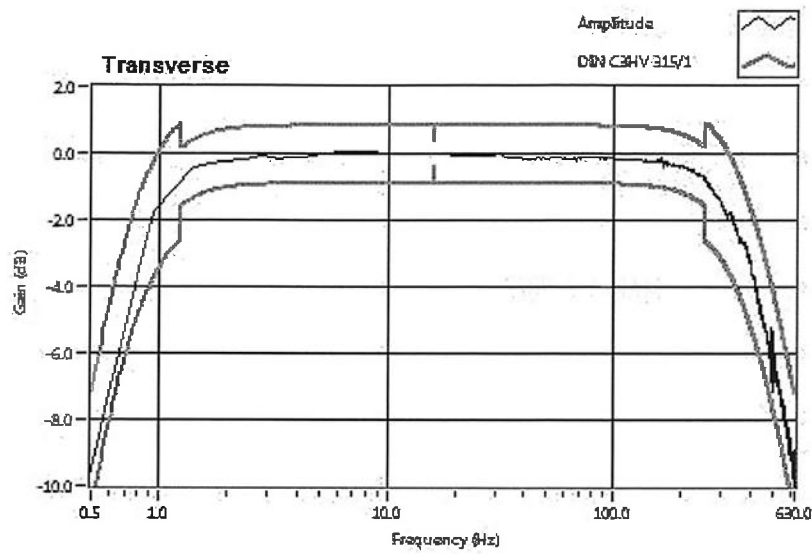
Xiaoming Yang



Instantel

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

Frequency Response of UM21456



Calibration Certificate

Part Number: 721A2601

Description: Micromate with DIN Geophone

Serial Number: UM21455

Calibration Date: **MAR 17 2023**

Calibration Reference Equipment: 714J7402

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

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

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

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

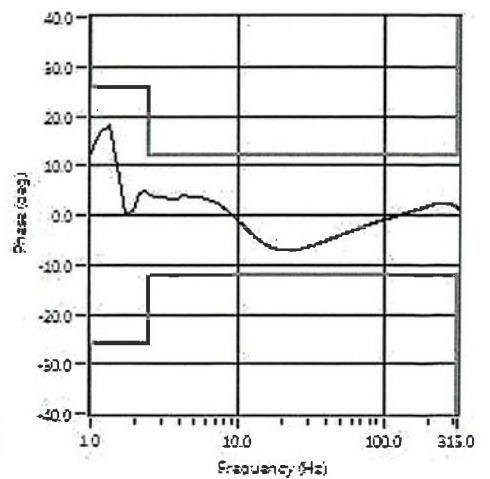
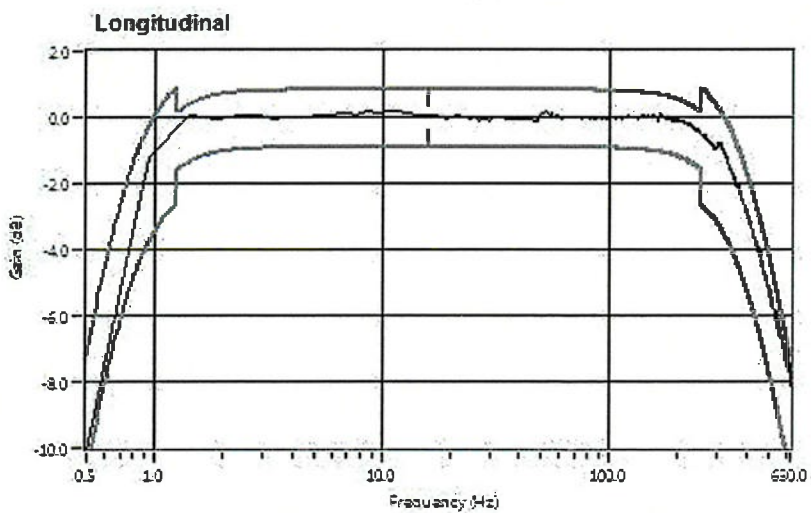
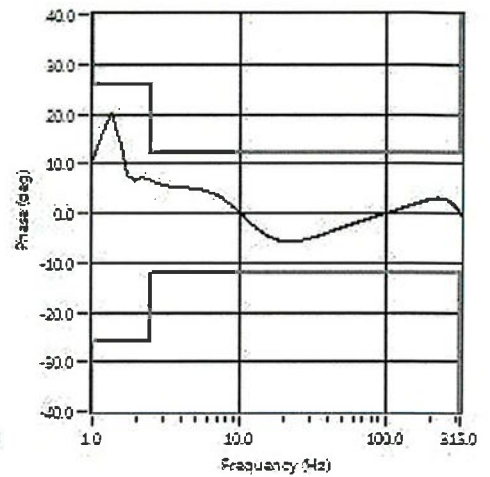
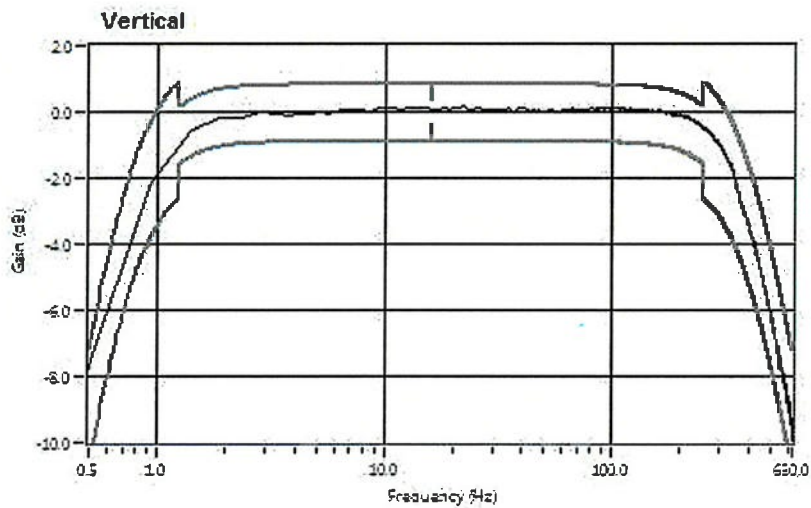
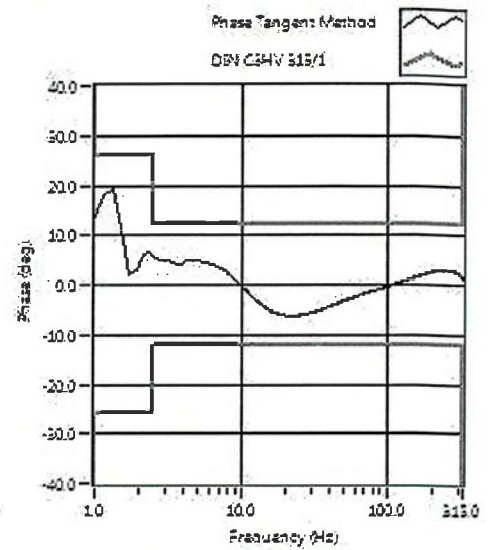
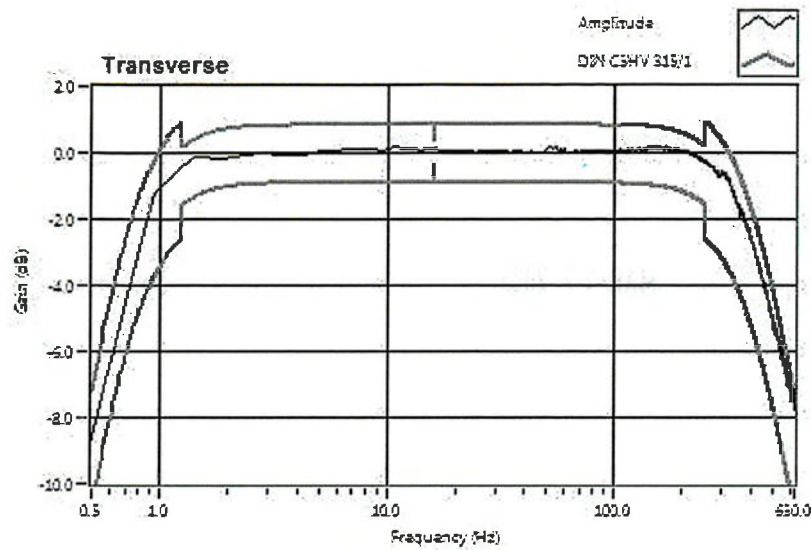
Calibrated By: _____

Xiaoming Yang



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

Frequency Response of UM21455



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: _____

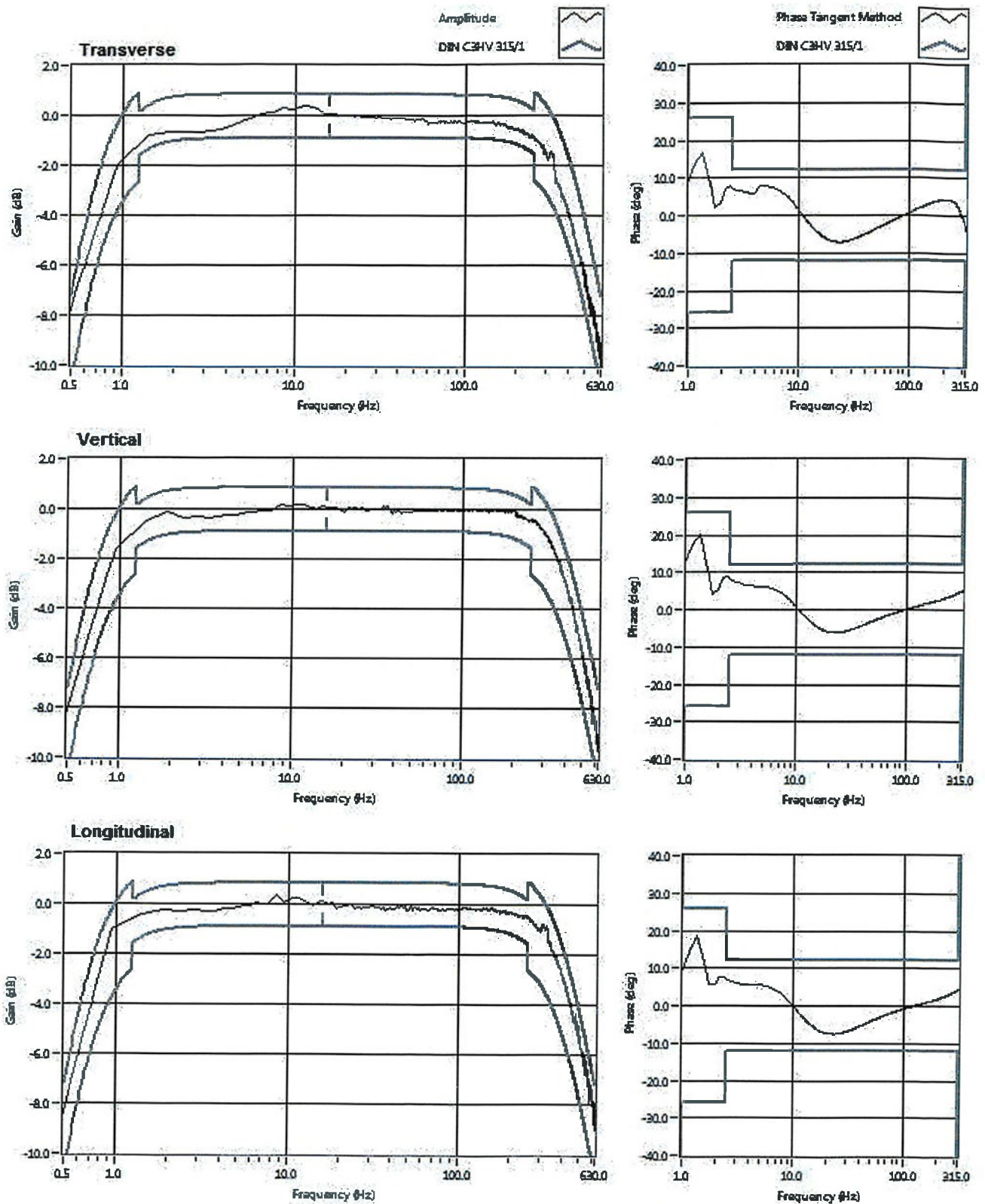
Martin Hogue,



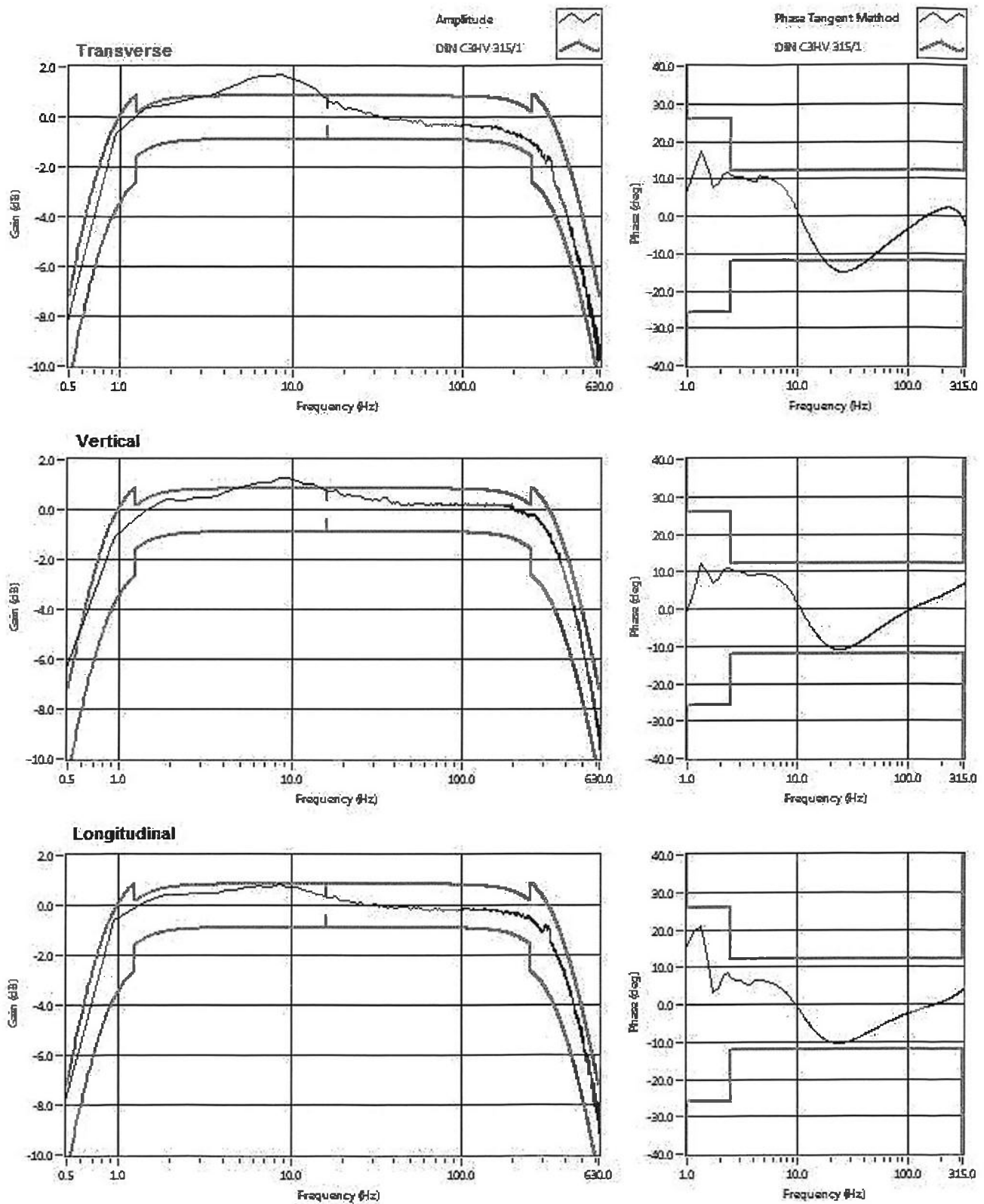
Instantel

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

Frequency Response of UM20454



Frequency Response of UM20454 (As Found)



**Inctech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com



Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MT23-6059

Page : 1 of 2

Customer : Smile Laboratory Co.,Ltd.

Address : 563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok, 10160

Description : Digital Thermometer

Manufacturer : Fluke

Model : 51II

Serial No. : 36650190WS

Identification No. : SML.DT001/61

Calibration Place : Temperature Laboratory

Order No. : 3156/23

Received date : Oct 03, 2023

Calibration date : Oct 06, 2023

Environment Condition :

Temperature : (23+/-3) °C

Humidity : (50+/-15) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MT-001* According to comparison with Standard Digital Thermometer with 2 PRT.
The calibration methods based on ITS-90.

Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
Standard Digital Thermometer with 2 PRT	1586A/5609/5609	41130006/00543/03713	TE23-0007	Jan 13, 2024

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

Traceability : This measurement are traceable to the International System of Unit (SI), through
National Institute of Metrology Thailand (NIMT)

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2$,
providing a level of confidence of not less than 95%



Calibrated by : Miss Jarunee Tubsay
Issue date : Oct 06, 2023

Approved by : _____
(Mr.Panuwat Phuklan)

This calibration certificate shall not be reproduced other than in full except with the prior written approval of Inctech Metrological Center Co.,Ltd

**Inctech Metrological Center Co.Ltd.**39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, ThailandTel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.comCalibration Cert. # 3884.01
ISO/IEC 17025**Certificate No. : MT23-6059****Page : 2 of 2**

Result : Without Adjustment
Function : Temperature measurement
Sensor Type : Thermocouple type K (wire)
Diameter : - mm
Calibration point : 4, 20, 104, 150, 180 °C

Resolution : 0.1 °C

Immersion depth (mm)	Calibration point (°C)	Standard reading (°C)	UUC* reading (°C)	UUC* correction (°C)	Uncertainty of measurement (+/- °C)
140	4	4.053	4.2	-0.147	0.24
140	20	20.025	20.2	-0.175	0.24
140	104	104.075	103.7	0.375	0.47
140	150	150.061	149.6	0.461	0.47
140	180	180.036	179.6	0.436	0.47
140	4	4.044	4.2	-0.156	0.24

UUC* = Unit under calibration



Inctech Metrological Center Co.Ltd.

39/1 Soi 82, Sukhapiaban 5 Rd., O ngoen,
Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com



Certificate of Calibration

Certificate No. : MT23-6082

Page : 1 of 2

Customer : Smile Laboratory Co.,Ltd.

Address : 563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok, 10160

Description : Digital Thermo & Hygrometer

Manufacturer : Genec

Model : ETTH2000-TH

Serial No. : H2000BC271

Identification No. : SML.TH001/61

Calibration Place : Temperature & Humidity Laboratory

Order No. : 3156/23

Received date : Oct 03, 2023

Calibration date : Oct 06, 2023

Environment Condition :

Temperature : (23+/-3) °C

Humidity : (50+/-15) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MT-007* According to comparison with Standard Temperature & Humidity into Environmental Stability Chamber.

Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
Standard Digital Hygrometer	One-TH	0x0000158D000E121E	SG-H-00987/65	Nov 10, 2023
Standard Digital Thermometer with Probe	UM RTD	2002Z A21 0181A	MT23-4665	Jul 14, 2024

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

Traceability : This measurement are traceable to the International System of Unit (SI), through
National Institute of Metrology Thailand (NIMT)

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2$,
providing a level of confidence of not less than 95%



Calibrated by : Miss Jarunee Tubsay

Issue date : Oct 06, 2023

Approved by :
(Mr.Panuwat Phuklan)

This calibration certificate shall not be reproduced other than in full except with the prior written approval of Inctech Metrological Center Co.,Ltd



Result : Without adjustment
Function : Temperature measurement
Calibration point : 25 °C
Resolution : 0.1 °C
Standard Humidity reading : 49.91 %RH

Test point (°C)	Standard reading (°C)	UUC* reading (°C)	UUC* correction (°C)	Uncertainty of measurement (+/- °C)
25	25.06	25.6	-0.54	0.36

Result : Without adjustment
Function : Humidity measurement
Calibration point : 50 %RH
Resolution : 1 %RH
Standard Temperature reading : 25.08 °C

Test point (%RH)	Standard reading (%RH)	UUC* reading (%RH)	UUC* correction (%RH)	Uncertainty of measurement (+/- %RH)
50	50.16	47	3.16	2.3

UUC* = Unit under calibration



Inctech Metrological Center Co.Ltd.

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,

Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com



Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MM23-3120

Page : 1 of 2

Customer : Smile Laboratory Co.,Ltd.

Address : 563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok, 10160

Description : Standard Weight Set

Manufacturer : N/A

Model : 500 mg-200 g

Serial No. : N/A

Identification No. : STD.W.001-007-55

Calibration Place : Mass & Torque Laboratory

Order No. : 3156/23

Received date : Oct 03, 2023

Calibration date : Oct 05, 2023

Environment Condition :

Temperature : (23+/-3) °C

Humidity : (50+/-15) %RH

Atm. Pressure : (1010+/-10) hPa

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MM-007* According to comparison with the reference Standard Weight Set and mass comparator.
The calibration methods based on OIML : R111-1 : 2004

Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
Standard Weight Set E1	NC-001-0.2K-E1-ASS	0022	NC-527	Oct 17, 2024

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

Traceability : This measurement are traceable to the International System of Unit (SI), through National Institute of Metrology (Thailand)

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor $k = 2$, providing a level of confidence of not less than 95%



Calibrated by : Mr.Somlak Wongkham

Issue date : Oct 05, 2023

Approved by :
(Miss.Valailuck Janyanitas)

This calibration certificate shall not be reproduced other than in full except with the prior written approval of Inctech Metrological Center Co.,Ltd

**Inctech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiaban 5 Rd., O ngoen,

Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.comCalibration Cert. # 3884.01
ISO/IEC 17025

Certificate No. : MM23-3120

Page : 2 of 2

Calibration Result : Without Adjustment

Identification No.	Nominal Values			Conventional Mass					Uncertainty	
				Before Adjustment			After Adjustment		of Measurement	
	Weight							(+/-)		
-	500	mg	500	mg	-0.01	mg	-	-	0.012	mg
-	1	g	1	g	0.00	mg	-	-	0.014	mg
-	5	g	5	g	0.01	mg	-	-	0.020	mg
-	10	g	10	g	0.02	mg	-	-	0.025	mg
-	50	g	50	g	-0.01	mg	-	-	0.037	mg
-	100	g	100	g	-0.02	mg	-	-	0.060	mg
-	200	g	200	g	0.02	mg	-	-	0.61	mg



Certificate of Calibration

Certificate No. : MT23-6058

Page : 1 of 2

Customer : Smile Laboratory Co.,Ltd.

Address : 563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok, 10160

Description : Refrigerator

Manufacturer : Accuplus

Model : SMART i250

Serial No. : 2059-1117-0035

Identification No. : SML.IN002/61

Calibration Place : Laboratory Room

Order No. : 3156/23

Received date : Oct 03, 2023

Calibration date : Oct 03, 2023

Environment Condition :

Temperature : (25+/-10) °C

Humidity : (50+/-30) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MT-006* According to comparison with LXI Data Acquisition Switch Unit with sensor. The calibration methods based on Euramet Calibration Guide No.20 - guidelines on the Calibration of Temperature and/or Humidity Controlled Enclosures.

Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
LXI Data Acquisition Switch Unit with Sensor	34972A	MY49028922	MT22-6393	Nov 24, 2023

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

Traceability : This measurement are traceable to the International System of Unit (SI), through
National Institute of Metrology Thailand (NIMT)

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2$,
providing a level of confidence of not less than 95%



Calibrated by : Mr.Nattaphong Phogard

Issue date : Oct 06, 2023

Approved by : (Mr.Panuwat Phuklan)

This calibration certificate shall not be reproduced other than in full except with the prior written approval of Inctech Metrological Center Co.,Ltd

Certificate No. : MT23-6058

Page : 2 of 2

Function : Temperature measurement

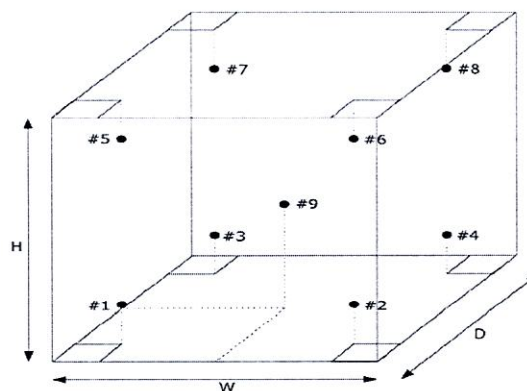
Result : Without adjustment

Calibration point : 4 °C

Resolution : 0.1 °C

Calibration point (°C)	Temperature of UUC* at each position (°C)									Uncertainty of measurement (+/- °C)
	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ch.8	Ch.9	
4	5.321	4.710	4.983	4.837	4.990	4.665	5.131	4.696	4.933	0.31

Setting temperature (°C)	Indicating Temperature (°C)	Measured stability (+/- °C)	Measured uniformity (°C)	Overall variation (°C)
4.0	4.1 to 4.3	0.15	0.53	1.0


Front view

- #1 Lower Left Front
- #2 Lower Right Front
- #3 Lower Left Rear
- #4 Lower Right Rear
- #5 Upper Left Front
- #6 Upper Right Front
- #7 Upper Left Rear
- #8 Upper Right Rear
- #9 Geometric Center

UUC* = Unit under calibration

Uniformity = Maximum and Minimum difference of measured temperature at any probes and the measured temperature at the reference and same time.

Overall Variation = Difference of temperature value between the maximum and minimum any time.

Stability = One half of the maximum difference of measured temperatures at any one probe.

**Inctech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com



Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MT23-6056

Page : 1 of 2

Customer : Smile Laboratory Co.,Ltd.

Address : 563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok, 10160

Description : Liquid in Glass Thermometer

Manufacturer : Precision

Model : 0 - 100 °C

Serial No. : 43622

Identification No. : SML.LT001/61

Calibration Place : Laboratory Room

Order No. : 3156/23

Received date : Oct 03, 2023

Calibration date : Oct 03, 2023

Environment Condition :

Temperature : (25+/-10) °C

Humidity : (50+/-30) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MT-001* According to comparison with Standard Digital Thermometer.
The calibration methods based on ITS-90.

Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
Standard Digital Thermometer	UM RTD	2002Z Z38 0073A	MT22-6383	Nov 21, 2023

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

Traceability : This measurement are traceable to the International System of Unit (SI), through
National Institute of Metrology Thailand (NIMT)

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2$,
providing a level of confidence of not less than 95%



Calibrated by : Mr.Kriengkrai Jomthaisong

Issue date : Oct 06, 2023

Approved by :

(Mr.Panuwat Phuklan)

This calibration certificate shall not be reproduced other than in full except with the prior written approval of Inctech Metrological Center Co.,Ltd

**Inctech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,

Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.comCalibration Cert. # 3884.01
ISO/IEC 17025

Certificate No. : MT23-6056

Page : 2 of 2

Result : Without Adjustment
Function : Temperature measurement
Resolution : 0.5 °C
Type : Total immersion
Calibration point : 20, 30, 40 °C

Immersion depth (mm)	Calibration point (°C)	Standard reading (°C)	UUC* reading (°C)	UUC* correction (°C)	Uncertainty of measurement (+/- °C)
-	20	20.05	20.0	0.05	0.35
-	30	30.04	30.0	0.04	0.35
-	40	40.04	40.0	0.04	0.35
-	20	20.05	20.0	0.05	0.35

UUC* = Unit under calibration



Inctech Metrological Center Co.Ltd.

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com



Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MT23-6055

Page : 1 of 3

Customer : Smile Laboratory Co.,Ltd.

Address : 563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok, 10160

Description : COD Reactor

Manufacturer : Hach

Model : DRB200

Serial No. : 12020C0330

Identification No. : SML.CR002/61

Calibration Place : Temperature Laboratory

Order No. : 3156/23

Received date : Oct 03, 2023

Calibration date : Oct 06, 2023

Environment Condition :

Temperature : (23+/-3) °C

Humidity : (50+/-15) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MT-009* According to comparison with LXI Data Acquisition Switch Unit.

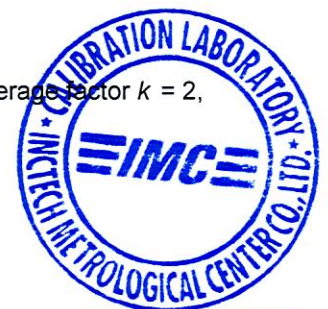
Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
LXI Data Acquisition Switch Unit with RTD Sensor	34972A	MY49028922	MT22-6393	Nov 24, 2023

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

Traceability : This measurement are traceable to the International System of Unit (SI), through
National Institute of Metrology Thailand (NIMT)

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2$,
providing a level of confidence of not less than 95%



Calibrated by : Mr.Jarunee Tubsay

Issue date : Oct 06, 2023

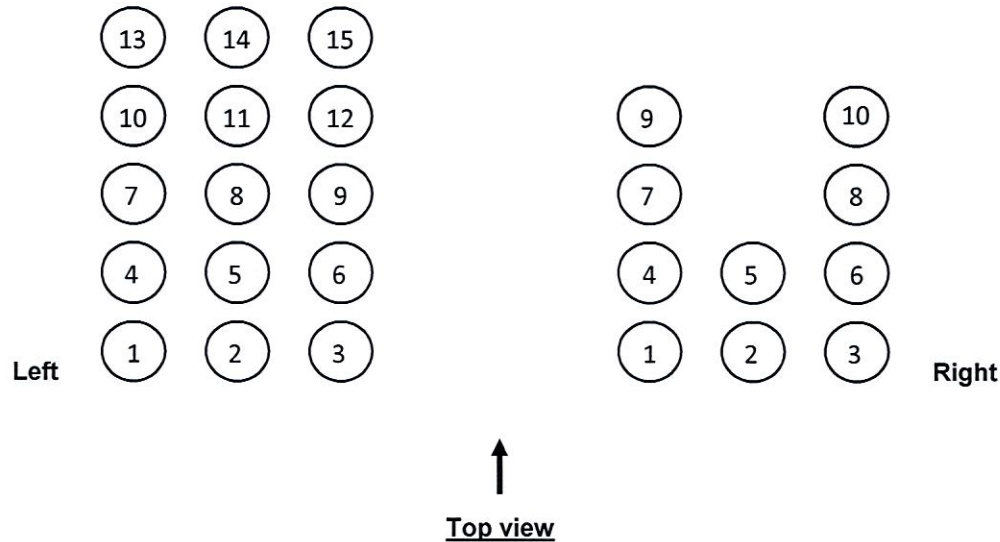
Approved by : _____
(Mr.Panuwat Phuklan)

This calibration certificate shall not be reproduced other than in full except with the prior written
approval of Inctech Metrological Center Co.,Ltd

**Inctech Metrological Center Co.Ltd.**39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, ThailandTel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.comCalibration Cert. # 3884.01
ISO/IEC 17025

Certificate No. : MT23-6055

Page : 2 of 3

Position

Function : Temperature measurement

Result : Without adjustment

Calibration point : 150 °C

Immersion depth : 50 mm.

Position Left No.	UUC* setting (°C)	Standard reading (°C)	UUC* correction (°C)	Uncertainty of measurement (+/- °C)
1	150	150.701	0.701	0.12
2	150	150.215	0.215	0.12
3	150	151.057	1.057	0.12
4	150	151.007	1.007	0.12
5	150	151.021	1.021	0.12
6	150	151.145	1.145	0.12
7	150	150.864	0.864	0.12
8	150	150.583	0.583	0.12
9	150	151.098	1.098	0.12
10	150	151.109	1.109	0.12
11	150	149.660	-0.340	0.12
12	150	150.249	0.249	0.12
13	150	149.685	-0.315	0.12
14	150	149.471	-0.529	0.12
15	150	149.680	-0.320	0.12

UUC* = Unit under calibration

**Inctech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,

Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com

Calibration Cert. # 3884.01

ISO/IEC 17025

Certificate No. : MT23-6055**Page : 3 of 3****Function : Temperature measurement****Result : Without adjustment****Calibration point : 150 °C****Immersion depth : 50 mm.**

Position Right No.	UUC* setting (°C)	Standard reading (°C)	UUC* correction (°C)	Uncertainty of measurement (+/- °C)
1	150	149.768	-0.232	0.12
2	150	149.611	-0.389	0.12
3	150	149.448	-0.552	0.12
4	150	149.880	-0.120	0.12
5	150	149.805	-0.195	0.12
6	150	149.902	-0.098	0.12
7	150	149.955	-0.045	0.12
8	150	150.134	0.134	0.12
9	150	149.510	-0.490	0.12
10	150	150.179	0.179	0.12

UUC* = Unit under calibration



Inctech Metrological Center Co.Ltd.

39/1 Soi 82, Sukhaphiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com



Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MM23-3116

Page : 1 of 3

Customer : Smile Laboratory Co.,Ltd.

Address : 563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok, 10160

Description : Electronic Balance

Manufacturer : Mettler Toledo

Model : MS205DU

Serial No. : 850938841

Identification No. : SML.AB002/61

Calibration Place : Balance Room

Order No. : 3156/23

Received date : Oct 03, 2023

Calibration date : Oct 03, 2023

Environment Condition :

Temperature : (25+/-10) °C

Humidity : (50+/-30) %RH

Atm. Pressure : (1010+/-10) hPa

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MM-001*
According to comparison with Standard Weight Set.
The calibration methods based on UKAS - LAB 14 : 2022

Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
Standard Weight Set	NC-001-0.2K-E1-ASS	0022	NC-527	Oct 17, 2024

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

Traceability : This measurement are traceable to the International System of Unit (SI), through
National Institute of Metrology (Thailand)

The reported uncertainty of measurement was base on standard uncertainty multiplied by coverage factor $k = 2$,
providing a level of confidence of not less than 95%



Calibrated by : Mr.Kriengkrai Jomthaisong

Issue date : Oct 05, 2023

Approved by :

(Miss.Valailuck Janyanitas)

This calibration certificate shall not be reproduced other than in full except with the prior written
approval of Inctech Metrological Center Co.,Ltd

**Inctech Metrological Center Co.Ltd.**39/1 Soi 82, Sukhapiaban 5 Rd., O ngoen,
Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com

Calibration Cert. # 3884.01
ISO/IEC 17025

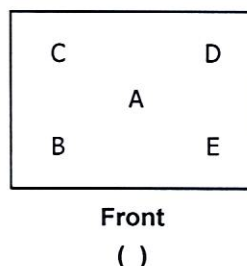
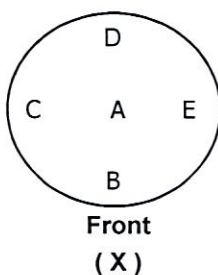
Certificate No. : MM23-3116

Page : 2 of 3

Calibration Result : Without Adjustment
 Function : Repeatability
 Maximum Capacity : 200 g
 Resolution : 0 to 82 g = 0.00001 g
 > 82 g = 0.0001 g

Nominal Weight Value	Instrument Deviation of Reading
(g)	(g)
200	0.0000

Calibration Result : Without Adjustment
 Function : Effect of Off Center Loading



A Mass of 100 Was Placed to various Position on the pan.

The Weight Machine Reading Obtained is Given in The Tabel

Load	Measuring Positions					Maximum Different	
	A	B	C	D	E		
	(g)	(g)	(g)	(g)	(g)		
100	100.0001	100.0001	100.0001	100.0003	100.0001	100.0001	0.0002

Calibration Result : Without Adjustment
 Function : Effect of Tare

Nominal Tare Weight	Standard Weight		UUC* Reading	UUC* Deviation
(g)	(g)		(g)	(g)
100	Tare		0.00000	0.00000
	At 20 %	20	20.00002	-0.00002
	At 40 %	40	40.00006	-0.00006
	At 60 %	60	60.00001	-0.00001
	At 80 %	80	80.00001	-0.00001
	At 100 %	100	100.0002	-0.0002

UUC* = Unit Under Calibration

**Inctech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,

Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.comCalibration Cert. # 3884.01
ISO/IEC 17025

Certificate No. : MM23-3116

Page : 3 of 3

Calibration Result : Without Adjustment

Function : Departure of indication from nominal value

Standard Weight Value (g)	UUC* Reading (g)	UUC* Correction (g)	Uncertainty of Measurement (+/- g)
0.00000	0.00000	0.00000	0.000010
20.00003	20.00002	0.00001	0.000056
40.00008	40.00006	0.00002	0.000084
60.00006	60.00004	0.00002	0.00015
80.00004	80.00001	0.00003	0.00015
100.0000	100.0000	0.0000	0.00016
120.0002	120.0002	0.0000	0.00031
140.0001	140.0001	0.0000	0.00031
160.0002	160.0002	0.0000	0.00031
180.0002	180.0002	0.0000	0.00031
200.0001	200.0001	0.0000	0.00031

UUC* = Unit Under Calibration



Certificate of Calibration

Certificate No. : MC23-2400

Page : 1 of 3

Customer : Smile Laboratory Co., Ltd.

Address : 563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok, 10160

Description : Spectrophotometer

Manufacturer : Hach

Model : DR 6000

Serial No. : 1735844

Identification No. : SML.UV001/61

Calibration Place : Chemical Laboratory 1

Order No. : 3156/23

Received date : Oct 03, 2023

Calibration date : Oct 05, 2023

Environment Condition :

Temperature : (23+/-3) °C

Humidity : (50+/-15) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure CP-MC-008. According to direct measurement with wavelength standard filter and absorbance standard filter.

Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
Neutral Density Filter	RM-1N2N3N	18944	CI-0137-23	Apr 25, 2025
Holmium Filter	RM-HG	19136	CI-0138-23	Apr 24, 2025

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

Traceability : This measurement are traceable to the International System of Unit (SI), through National Institute of Metrology Thailand (NIMT)

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2$, providing a level of confidence of not less than 95%



Calibrated by : Miss Nuengruethai Siripoch

Issue date : Oct 05, 2023

Approved by :

(Mr. Panuwat Phuklan)

This calibration certificate shall not be reproduced other than in full except with the prior written approval of Inctech Metrological Center Co.,Ltd

**Inctech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,

Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.comCalibration Cert. # 3884.01
ISO/IEC 17025

Certificate No. : MC23-2400

Page : 2 of 3

Result : Without adjustment
Function : Photometric accuracy

Wavelength setting (nm)	Standard value (Abs)	UUC* reading (Abs)	UUC* correction (Abs)	Uncertainty of measurement (+/- Abs)
440	0.0000	0.000	0.0000	0.003
	0.5537	0.557	-0.0033	0.003
	0.7450	0.749	-0.0040	0.003
	0.9898	0.990	-0.0002	0.003
465	0.0000	0.000	0.0000	0.003
	0.5142	0.517	-0.0028	0.003
	0.6873	0.691	-0.0037	0.003
	0.9400	0.939	0.0010	0.003
546.1	0.0000	0.000	0.0000	0.003
	0.5104	0.511	-0.0006	0.003
	0.6953	0.697	-0.0017	0.003
	0.9831	0.981	0.0021	0.003
590	0.0000	0.000	0.0000	0.003
	0.5439	0.543	0.0009	0.003
	0.7230	0.724	-0.0010	0.003
	1.0785	1.076	0.0025	0.003
635	0.0000	0.000	0.0000	0.003
	0.5511	0.550	0.0011	0.003
	0.6900	0.691	-0.0010	0.003
	1.0715	1.069	0.0025	0.003

UUC* = Unit under calibration

**Inctech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com



Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate No. : MC23-2400

Page : 3 of 3

Result : Without adjustment
Function : Wavelength accuracy

Spectral Band Width : 2 nm

Scan Speed : -

Standard value (nm)	UUC* reading (nm)	UUC* correction (nm)	Uncertainty of measurement (+/- nm)
288.04	288.0	0.04	0.14
418.34	418.0	0.34	0.14
446.01	446.0	0.01	0.14
536.39	536.0	0.39	0.14
637.84	638.0	-0.16	0.14

UUC* = Unit under calibration

**Inctech Metrological Center Co.Ltd.**39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, ThailandTel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.comCalibration Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MC23-2370

Page : 1 of 2

Customer : Smile Laboratory Co., Ltd.

Address : 563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok, 10160

Description : pH Meter

Manufacturer : Mettler Toledo

Model : Seven Direct SD20

Serial No. : C238817351

Identification No. : SML.PH001/61

Calibration Place : Laboratory Room

Order No. : 3156/23

Received date : Oct 03, 2023

Calibration date : Oct 03, 2023

Environment Condition :

Temperature : (25+/-10) °C

Humidity : (50+/-30) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MC-001* According to direct with Standard Thermometer and Standard Buffer Solution at 25 °C. The calibration methods based on ISO 10523 Water quality - Determination of pH, NIST : 1994.

Calibration were conducted using In-house calibration procedure *CP-MT-001* According to comparison with Standard Digital Thermometer.

The calibration methods based on ITS-90.

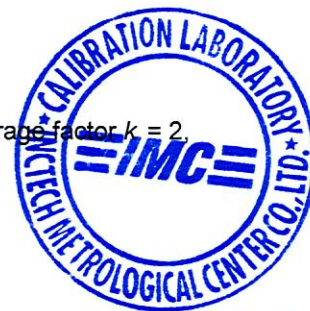
Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
Digital Thermometer	EFT-4	EFT42020033	MT23-3227	May 01, 2024
Standard Digital Thermometer	UM RTD	2002Z Z38 0073A	MT22-6383	Nov 21, 2023
<u>Instrument</u>	<u>Model</u>	<u>Lot No.</u>	<u>Expired Date.</u>	
Standard Buffer Solution (4 pH)	1040525C	4C22E1	May 28, 2025	
Standard Buffer Solution (7 pH)	1070525C	725C22B1	Feb 28, 2024	
Standard Buffer Solution (10 pH)	1100525C	1125C22B1	Feb 28, 2024	

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

Traceability : This measurement are traceable to the International System of Unit (SI), through
National Institute of Metrology Thailand (NIMT)

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2$,
providing a level of confidence of not less than 95%

Calibrated by : Mr.Kriengkrai JomthaisongIssue date : Oct 05, 2023

Approved by : _____

(Mr.Panuwat Phuklan)

This calibration certificate shall not be reproduced other than in full except with the prior written
approval of Inctech Metrological Center Co.,Ltd

**Inctech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,

Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com

Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate No. : MC23-2370

Page : 2 of 2

Function : pH measurement (Electrode)

Calibration point : 4, 7, 10 pH

Probe S/N : 2228537

Result : Without adjustment

Resolution : 0.01 pH

Standard Buffer (pH)	UUC* reading (pH)	UUC* correction (pH)	Uncertainty of measurement (+/- pH)
4.01	4.00	0.01	0.017
7.00	6.99	0.01	0.017
9.99	10.00	-0.01	0.017

Function : Temperature measurement

Sensor Type : Thermistor

Diameter : 12 mm

Calibration point : 23, 25, 27 °C

Result : Without adjustment

Resolution : 0.1 °C

Immersion depth (mm)	Calibration point (°C)	Standard reading (°C)	UUC* reading (°C)	UUC* correction (°C)	Uncertainty of measurement (+/- °C)
100	23	23.04	23.3	-0.26	0.20
100	25	25.04	25.2	-0.16	0.20
100	27	27.04	27.1	-0.06	0.20
100	23	23.04	23.3	-0.26	0.20

UUC* = Unit under calibration

**Inctech Metrological Center Co.Ltd.**39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com

Calibration Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MT23-6054

Page : 1 of 2

Customer : Smile Laboratory Co.,Ltd.

Address : 563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok, 10160

Description : Incubator

Manufacturer : Bio Base

Model : BJPX-B7011

Serial No. : 201705233231

Identification No. : SML.IN001/61

Calibration Place : Laboratory Room

Order No. : 3156/23

Received date : Oct 03, 2023

Calibration date : Oct 03, 2023

Environment Condition :

Temperature : (25+/-10) °C

Humidity : (50+/-30) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MT-006* According to comparison with LXI Data Acquisition Switch Unit with sensor. The calibration methods based on Euramet Calibration Guide No.20 - guidelines on the Calibration of Temperature and/or Humidity Controlled Enclosures.

Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
LXI Data Acquisition Switch Unit with Sensor	34972A	MY49028922	MT22-6393	Nov 24, 2023

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

Traceability : This measurement are traceable to the International System of Unit (SI), through
National Institute of Metrology Thailand (NIMT)

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2$,
providing a level of confidence of not less than 95%



Calibrated by : Mr.Nattaphong Phogard
Issue date : Oct 06, 2023

Approved by : _____
(Mr.Panuwat Phuklan)

This calibration certificate shall not be reproduced other than in full except with the prior written
approval of Inctech Metrological Center Co.,Ltd

**Inctech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,

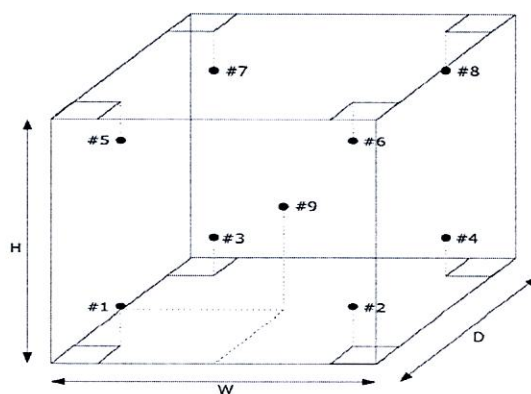
Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com

Calibration Cert. # 3884.01
ISO/IEC 17025**Certificate No.** : MT23-6054**Page** : 2 of 2**Function** : Temperature measurement**Result** : Without adjustment**Calibration point** : 20 °C**Resolution** : 0.1 °C

Calibration point (°C)	Temperature of UUC* at each position (°C)									Uncertainty of measurement (+/- °C)
	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ch.8	Ch.9	
20	20.110	19.987	20.380	20.217	20.126	20.149	20.103	20.045	20.259	0.31

Setting temperature (°C)	Indicating Temperature (°C)	Measured stability (+/- °C)	Measured uniformity (°C)	Overall variation (°C)
20.0	20.0	0.07	0.32	0.53



- #1 Lower Left Front
- #2 Lower Right Front
- #3 Lower Left Rear
- #4 Lower Right Rear
- #5 Upper Left Front
- #6 Upper Right Front
- #7 Upper Left Rear
- #8 Upper Right Rear
- #9 Geometric Center

Front view**UUC*** = Unit under calibration**Uniformity** = Maximum and Minimum difference of measured temperature at any probes and the measured temperature at the reference and same time.**Overall Variation** = Difference of temperature value between the maximum and minimum any time.**Stability** = One half of the maximum difference of measured temperatures at any one probe.

**Inctech Metrological Center Co.Ltd.**39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, ThailandTel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.comCalibration Cert. # 3884.01
ISO/IEC 17025

Certificate of Calibration

Certificate No. : MT23-6057

Page : 1 of 2

Customer : Smile Laboratory Co.,Ltd.

Address : 563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok, 10160

Description : Hot Air Oven

Manufacturer : Bio Base

Model : BOV-V30F

Serial No. : 175226

Identification No. : SML.OV001/61

Calibration Place : Laboratory Room

Order No. : 3156/23

Received date : Oct 03, 2023

Calibration date : Oct 03, 2023

Environment Condition :

Temperature : (25+/-10) °C

Humidity : (50+/-30) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure *CP-MT-006* According to comparison with LXI Data Acquisition Switch Unit with sensor. The calibration methods based on Euramet Calibration Guide No.20 - guidelines on the Calibration of Temperature and/or Humidity Controlled Enclosures.

Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
LXI Data Acquisition Switch Unit with Sensor	34972A	MY49028922	MT22-6393	Nov 24, 2023

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

Traceability : This measurement are traceable to the International System of Unit (SI), through
National Institute of Metrology Thailand (NIMT)

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2$,
providing a level of confidence of not less than 95%



Calibrated by : Mr.Nattaphong Phogard

Issue date : Oct 06, 2023

Approved by :

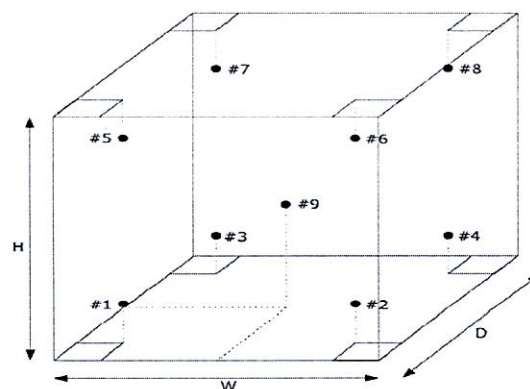
(Mr.Panuwat Phuklan)

This calibration certificate shall not be reproduced other than in full except with the prior written
approval of Inctech Metrological Center Co.,Ltd

**Inctech Metrological Center Co.Ltd.**39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,
Saimai, Bangkok 10220, ThailandTel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.comCalibration Cert. # 3884.01
ISO/IEC 17025**Certificate No.** : MT23-6057**Page** : 2 of 2**Function** : Temperature measurement**Result** : Without adjustment**Calibration point** : 104, 150, 180 °C**Resolution** : 0.1 °C

Calibration point (°C)	Temperature of UUC* at each position (°C)									Uncertainty of measurement (+/- °C)
	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ch.8	Ch.9	
104	104.459	104.103	104.369	104.477	104.772	104.047	104.293	104.497	104.837	0.44
150	150.112	150.203	150.620	150.164	150.465	150.112	150.498	150.129	150.623	0.44
180	178.765	179.298	179.719	179.639	179.695	179.465	179.079	179.155	179.774	0.58

Setting temperature (°C)	Indicating Temperature (°C)	Measured stability (+/- °C)	Measured uniformity (°C)	Overall variation (°C)
104.0	104.0	0.15	0.95	1.1
150.0	150.1 to 150.2	0.24	0.90	1.2
180.0	180 to 180.2	0.34	1.6	1.9



- #1 Lower Left Front
- #2 Lower Right Front
- #3 Lower Left Rear
- #4 Lower Right Rear
- #5 Upper Left Front
- #6 Upper Right Front
- #7 Upper Left Rear
- #8 Upper Right Rear
- #9 Geometric Center

Front view**UUC*** = Unit under calibration**Uniformity** = Maximum and Minimum difference of measured temperature at any probes and the measured temperature at the reference and same time.**Overall Variation** = Difference of temperature value between the maximum and minimum any time.**Stability** = One half of the maximum difference of measured temperatures at any one probe.

**Inctech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,

Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.com

Certificate of Calibration

Certificate No. : ME23-2507

Page : 1 of 2

Customer : Smile Laboratory Co.,Ltd.
Address : 563/1 Thoet Thai Rd., Bangwa, Phasicharoen, Bangkok 10160

Description : Stop Watch
Manufacturer : Seiko
Model : S23601P
Serial No. : A12BI0147
Identification No. : ACF.WA002/59
Calibration Place : Time and Frequency Laboratory

Order No. : 3156/23
Received date : Oct 03, 2023
Calibration date : Oct 05, 2023
Environment Condition :
Temperature : (23 +/- 3) °C
Humidity : (50 +/- 15) %RH

Calibration Method : Calibration were conducted using In-house calibration procedure CP-ME-001.
According to comparison with Universal Counter.
The calibration methods based on NIST : SP960-12 : 2009.

Reference Standard Instruments :

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Certificate No.</u>	<u>Due Date</u>
Universal Counter	53131A	3416A06010	E3U230553	Apr 09, 2024

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

Traceability : This measurement are traceable to the International System of Unit (SI), through
National Institute of Metrology Thailand (NIMT)

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2$,
providing a level of confidence of not less than 95%



Calibrated by : Miss Nisachon Praiyong
Issue date : Oct 05, 2023

Approved by :
(Mr.Suthichai Chanthipa)

This calibration certificate shall not be reproduced other than in full except with the prior written
approval of Inctech Metrological Center Co.,Ltd

**Inctech Metrological Center Co.Ltd.**

39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,

Saimai, Bangkok 10220, Thailand

Tel. (662) 909-8820 (Auto 10 lines) www.imcinstrument.comCalibration Cert. # 3884.01
ISO/IEC 17025**Certificate No. : ME23-2507****Page : 2 of 2**

Calibration Result : Without Adjustment
Function : Quartz Crystal Measurement
Frequency Range : 32 kHz

Nominal Value (kHz)	Measurement Value (kHz)	Measurement Error (kHz)	Uncertainty of Measurement (+/- mHz)
32.768	32.7671	-0.0009	0.76

$$\begin{aligned}\text{Timebase in 1 second} &= \frac{\text{Nominal frequency (Hz)}}{\text{Actual frequency (Hz)}} \\ &= 1.0000275 \text{ sec}\end{aligned}$$

The uncertainty of time measurement was ± 0.76 mHz or ± 0.76 ms/s



Avio220 Preventive Maintenance Report

Company Name: Smile Laboratory Co.,Ltd.


Instrument Location: ICP Room,563/1 Thoet Thai Rd.,
Bangwa,Phasicharoen,Bangkok 10160 Thailand.

Instrument Serial No.: M79S2206243

Date: 19-January-2024

ICP-OES/Avio220 Preventive Maintenance (PM)

Company Name:	Smile Laboratory Co.,Ltd.		
Address (Instrument Location):	563/1 Thoet Thai Rd.,Bangwa,Phasicharoen,Bangkok 10160 Thailand.		
Serial Number:	M79S2206243	PM Number:	1 OF 2 W
Customer Name (if applicable):	K. Nantanaphon	Telephone Number:	094-9406014
Service Engineer Name:	Khun Piyawit	Service Order Number:	WO-02685682
Date PM Performed: (DD-MMM-YYYY)	19-Jan-2024	Next PM Due Date: (DD-MMM-YYYY)	19-July-2024
Standard Labor Hours to Complete PM :		4 hours	

Part Number	Release	Publication Date	
TH09370183 Rev.2	B	July 2020	

Scope

The purpose of this PM is to ensure the continued functionality of the PerkinElmer/Avio220 by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

General Instructions:

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

Copyright Information

This document contains proprietary information that is protected by copyright. All rights are reserved. No part of this publication may be reproduced in any form whatsoever or translated into any language without the prior, written permission of PerkinElmer, Inc. **Copyright © 2013 PerkinElmer, Inc.**

Trademarks

Registered names, trademarks, etc. used in this document, even when not specifically marked as such, are protected by law. PerkinElmer is a registered trademark of PerkinElmer, Inc. All other trademarks and registered trademarks not owned by PerkinElmer, Inc. or its subsidiaries that are depicted herein are the property of their respective owners.

Except as specifically set forth in its terms and conditions of sale, PerkinElmer makes no Warranty of any kind with regard to this document, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

PerkinElmer shall not be liable for incidental or consequential damages in connection with the furnishing or use of this document.

Component List

Component / Specific Model	Serial #	Configuration Notes
Avio220Max	M79S2206243	Syngistix v.5.10

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
09995098	Air Filter-Spectrometer	Not Applicable
N077520	Air Filter-RF Generator	Not Applicable
09992731	Axial Window	Not Applicable
B0810377	Radial Window	Not Applicable
N0770438	O-ring kit, injector support adapter	Not Applicable
N0780437	O-ring kit, torch	Not Applicable

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date: (MM/YY)
N0691579	Multi-Element Standard (N069-1579 diluted 10X)	1	7-263MFX1	30-Apr-2024
N9300221	Instrument Calibration-4 (N9300221 diluted 100X)	1	59-091CRY1	30-June-2024

Procedure Checklist

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

1. General:

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

2. Mechanical:

- ☒ Inspect and clean all fans and filters.
- ☒ Inspect and replace torch components and necessary.

Torch Components Replaced: ☐ Yes ☒ No

If yes, list components replaced:

- ☒ Inspect all tubing for signs of cracking or leaking and replace as necessary.

Tubing Replaced: ☒ Yes ☐ No

If yes, list tubing replaced:

- ☒ Inspect the peristaltic pump for proper operation.
- ☒ Check and adjust if necessary, the external nitrogen, argon shear gas and water supply pressures.
- ☒ Check and adjust if necessary, the internal nitrogen, main argon, torch argon and shear gas pressures

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

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

3. Electrical:

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

RF Generator:

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

Spectrometer:

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

4. Optical:

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

Neon Lamp Replaced: ☐ Yes ☒ No

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

Axial Window Replaced: ☐ Yes ☒ No

Radial Window Replaced: ☐ Yes ☒ No

5. Post PM Performance Tests:

- ☒ Perform View Align.

Test Spectral Resolution:

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

Parameter	Specification	Test Result	Pass/Fail
As 193.696 - Resolution	≤0.009	0.00852	Passed
Ni 231.604 - Resolution	≤0.011	0.00965	Passed
Ni 341.476 - Resolution	≤0.015	0.01465	Passed
Ba 455.403 - Resolution	≤0.020	0.01745	Passed

Test Precision

- ☒ Test for reproducibility of a set of measurement.

Parameter	Specification	Test Result	Pass/Fail
Zn 213.856	%RSD \leq 1 %	0.59%	Passed
Mg 280.856	%RSD \leq 1 %	0.40%	Passed
Mg 285.207	%RSD \leq 1 %	0.95%	Passed
Ba 455.403	%RSD \leq 1 %	0.09%	Passed

Test MnBEC:

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

Mn Background Equivalent Concentration:

Method "MnBEC" For Samples "IB (2%HNO3)" and "IS (N069-1579/10)", record intensities.

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

Element	Mode	Conc.	IB	IS	
Mn 257.610	Radial	1,000 ppb	162,878.7	12,041,240.9	
Mn 257.610	Axial	1,000 ppb	162,302.8	12,032,875.1	
Mn 257.610	IB*Conc.	IS - IB	BEC	Spec	Pass/Fail
Radial	162,878,70	11,878,362.2	13.71	<30 PPB	Passed
Axial	162,302,80	11,870,572.3	13.67	<30 PPB	Passed

6. Review:

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

Additional Comments

Additional Comments Regarding the PM	

Review

<p><i>The preventive maintenance checks and if applicable performance tests for ICP-OES/Avio220 have been completed.</i></p>	
<p><i>This ICP-OES/Avio220 Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.</i></p>	
<p>Review of Preventive Maintenance:</p>	
<p>Authorized PerkinElmer Representative:</p> <p><i>R. S.</i></p>	<p>Date:</p> <p>19-Jan-2024</p> <p>(DD-MMM-YYYY)</p>
<p>Authorized Customer Representative:</p>	<p>Date:</p> <p>19-Jan-2024</p> <p>(DD-MMM-YYYY)</p>