
เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์

CERTIFICATE OF CALIBRATION

Certificate No.: C0-1608001/24 Page 1 of total 4 pages

Customer WATER ANALYSIS CENTER CO., LTD.
1/94 Moo 5, T. Kanham,
A.U-thai, Ayutthaya 13210

Equipment pH Meter
Manufacturer METTLER TOLEDO **Model** SevenCompact S220
Serial No. B327527211 **ID No.** WWL 0068
Description Range : 0 - 14 pH, Resolution : 0.01 pH

Environmental Conditions Ambient Temperature: (20 ± 2) °C
Relative Humidity: (50 ± 10) %
Atmospheric Pressure: -

Calibration Location Jayhawks Laboratory (CL&GL)

Received Date 16 August 2024

Calibration Date 16 August 2024

Date of Issue 19 August 2024

Condition of Artifacts Used conditions but can be calibrated

Checked by Approved by

Act as Technical Manager

Representative of Managing Director

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

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FE-169

REV.02 02/24/21

Certificate No.: C0-1608001/24

Page 3 of total 4 pages

Measurement Results (Cont.):

2. Calibration of pH Electrode (Serial No.: 3222623)

pH Standard Solution (pH)	Measured Value		Uncertainty (± pH)
	(pH)	(mV)	
4.01	4.01	186.1	0.013
7.01	7.01	9.3	0.013
10.01	10.00	-164.5	0.013

Note : Adjust Curve to Buffer Solution pH (4,7,10)
Temperature stability of micro bath : 25 ± 0.2 °C

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

FE-169

Calibrated by Athipat
REV.02 02/24/21

ภาคผนวก ข-1

Certificate No.: C0-1608001/24

Page 2 of total 4 pages

Reference Method:

- The calibration method used was CP-178 based on an in-house method.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard:

Type	pH Value	Lot No.	Due Date	Traceability
pH Standard Solution	4.01	150823	Feb. 9, 2025	NIMT
	7.01	180723	Jan. 12, 2025	
	10.01	160823	Jan. 16, 2025	

Type	Serial No.	Certificate No.	Due Date	Traceability
Documenting Process Calibrator	2630521	10-2312001/23	Dec. 24, 2024	THC
Digital Thermometer with Sensor	1709138 / 4605984-005	10-0806001/24	Jun. 7, 2025	

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

- NIMT, National Institute of Metrology (Thailand).
- THC, Thai Heart Calibration Co., Ltd.

Measurement Results:

1. Function Simulated pH Meter

Standard Applied (mV)	Nominal Value (pH)	UUC Reading		Uncertainty (± mV)
		pH	mV	
177.48	4.00	4.01	177.3	0.060
0.00	7.00	7.00	-0.1	0.060
-177.48	10.00	10.01	-177.4	0.060

UUC : Unit Under Calibration

Note : Adjust Curve to simulate pH (4,7,10)

FE-169

Calibrated by Athipat
REV.02 02/24/21

Certificate No.: C0-1608001/24

Page 4 of total 4 pages

Reference Method:

- The calibration method used was CP-096 based on an in-house method.
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Serial No.	Cert. No.	Due Date	Traceability
Thermometer Readout	B7C853	10-0911001/23	Nov. 8, 2024	THC
Platinum Resistance Thermometer	4854	COA30047	Oct. 22, 2025	FLUKE
Liquid Bath	XO111019	10-2405001/23	May 25, 2025	THC

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

- THC, Thai Heart Calibration Co., Ltd.
- FLUKE, Fluke Corporation, U.S.A.

Measurement Results:

(X) Without Adjustment

Dimension of probe : Diameter 4 mm. Sensor Type : RTD (PT100)				
Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
120	22.00	22.2	-0.20	0.065
120	25.00	25.2	-0.20	0.065
120	28.00	28.2	-0.20	0.065

UUC : Unit Under Calibration

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

- End of Certificate -

FE-169

Calibrated by Pongsak
REV.02 02/24/21



THAI HEART CALIBRATION CO., LTD.
112/1 Moo 5, Phrak Sai, Muang, Samut Prakan 10280
Tel. 0-2394-2162, 0-2357-8435, 0-2757-8496 Fax: 0-2757-8507



CERTIFICATE OF CALIBRATION

Certificate No.: C0-1607004/24 Page 1 of total 2 pages

Customer WATER ANALYSIS CENTER CO., LTD.
1/94 Moo 5, T.Kanham,
A.U-thai, Ayutthaya 13210

Equipment Conductivity Meter
Manufacturer EUTECH **Model** CON 2700
Serial No. 2657889 **ID No.** WWL 0136
Description -

Environmental Conditions Ambient Temperature: (20 ± 2) °C
Relative Humidity: (50 ± 10) %
Atmospheric Pressure: -

Calibration Location Jayhawks Laboratory (CL&GL)

Received Date 16 July 2024

Calibration Date 18 July 2024

Date of Issue 18 July 2024

Condition of Artifacts Used conditions but can be calibrated

Checked by  **Approved by** 
Act as Technical Manager Representative of Managing Director

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

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REV.02 02/24/21



THAI HEART CALIBRATION CO., LTD.
112/1 Moo 5, Phrak Sai, Muang, Samut Prakan 10280
Tel. 0-2394-2162, 0-2357-8435, 0-2757-8496 Fax: 0-2757-8507



Certificate No.: C0-1607004/24

Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-177 based on an in-house method.

- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard :

Material	Batch Value	Lot Number	Due Date	Traceability
Conductivity Standard Solution	147.1 µS/cm	S230330005	Nov. 9, 2024	SCP Science
	1.423 mS/cm	S231129006	May 13, 2025	SCP Science

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

- SCP Science.

Measurement Results: (Probe Serial No.: 93X219065)

Conductivity Standard Solution	Measured Value	Correction	Uncertainty (±)
147.1 µS/cm	149.0 µS/cm	-1.9 µS/cm	2.5 µS/cm
1.423 mS/cm	1.425 mS/cm	-0.002 mS/cm	0.0052 mS/cm

Note : Adjustment points: 147.1µS/cm 1.423mS/cm

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

- End of Certificate -

FE-169

Calibrated by: Athipat
REV.02 02/24/21



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Certificate of Calibration

Certificate No. : MT24-7016
Page : 1 of 2

Customer : Water Analysis Center Co.,Ltd.
Address : 1/94 Moo 5, Rojana Industrial Park , T.Kanham, A.U-Thai, Ayutthaya 13210

Description : Refrigerator
Manufacturer : B.T.Metrology Co.,Ltd.
Model : REF 940L
Serial No. : BT-03-09-09
Identification No. : WWL 0043
Calibration Place : Customer Laboratory

Order No. : 2601/24
Received date : Aug 02, 2024
Calibration date : Aug 02, 2024
Environment Condition :
Temperature : (25±1.0) °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 :

Instrument	Model	Serial No.	Certificate No.	Due Date
LXI Data Acquisition Switch Unit with Sensor	34972A	MY49020096	MT23-7163	Nov 30, 2024

The effect that the result relate only to the items calibrated. It 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 expanded uncertainty of measurement was based on standard uncertainty multiplied coverage factor 2, providing a level of confidence of not less than 95%



Calibrated by : Mr.Yuttakorn Jamneansri

Approved by : 
(Mr.Panuwat Phukhan)
Issue date : Aug 09, 2024

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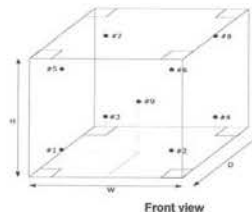
Certificate No. : MT24-7016
Page : 2 of 2

Function : Temperature measurement
Calibration point : 20 °C

Result : Without adjustment
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	20.344	20.098	20.405	20.375	20.193	20.010	20.245	20.090	20.037	0.41

Setting temperature (°C)	Indicating Temperature (°C)	Measured stability (±, °C)	Measured uniformity (°C)	Overall variation (°C)
20.0	20.0	0.30	0.68	0.86



#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.



Certificate of Calibration

Certificate Number : PL61070/24
Control Number : PCAL174170
Customer Control : WWL 0073
Description : Dissolved Oxygen Meter
Manufacturer : YSI
Model : YSI 5000
Serial Number : 14C100917
Customer : Water Analysis Center Co.,Ltd
1/94 Moo 5 T.Kanham A.U-Thai Ayutthaya 13210 Thailand

Page 1 of 3



Date of Receipt : 02-Dec-24
Date of Calibration : 02-Dec-24
Environment : Temperature 20 °C ± 2 °C
Relative Humidity 50 % ± 20 %
Calibration Method : Calibration Procedure Number CP-PL93
Calibration Results : See data attached

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

This certificate is issued in accordance with ISO/IEC 17025 and the conditions of accreditation granted by the Accreditation Body which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. The results relate only to the item calibrated.

This certificate shall not be reproduced other than in full except without the prior written approval of the Head of Calibration Laboratory of Professional Calibration & Services Co., Ltd.

Calibrated By

Ms. Supattra Mungkasm

Authorized Signature

(Mr. Jannong Junphong)

06-Dec-24

Issued Date

CALIBRATION REPORT

Professional Calibration & Services Co., Ltd.

Certificate No. : PL61070/24

Page : 3 of 3

Calibration Results

Dissolved Oxygen Calibration

Description of Meter : Range : 0 to 60 mg/l
Resolution : 0.01 mg/l
Description of Electrode : Manufacturer : YSI
Model : 5010
Serial No. : 15C100067
Type : Electrochemical (Membrane)

Calibration Point	Standard Value	UUC Reading	UUC Error	Uncertainty (s)
0 mg/l	0.000 mg/l **	0.00 mg/l	0.00 mg/l	0.03 mg/l
8 mg/l	8.454 mg/l	8.43 mg/l	-0.02 mg/l	0.05 mg/l
9 mg/l	9.020 mg/l	9.02 mg/l	0.00 mg/l	0.05 mg/l

Notes :

- 1). Calibration results that carry the double asterisk (**) are not accredited. Calibrations marked as such on this Certificate have been included for completeness.

...End...

CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : PL61070/24

Page 2 of 3

Equipment Standards Used

Description	Serial No.	Traceability to	Certificate No.	Cal. Due Date
Zero Oxygen Solution Set	-	NIST	S005023	01-May-28

Condition as received : Normal

Definitions :-

* NIST - National Institute of Standard and Technology



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Certificate of Calibration

Certificate No. : MT25-3161

Page : 1 of 2

Customer : Water Analysis Center Co.,Ltd.
Address : 1/94 Moo 5 , Rojana Industrial Park , T.Kanham, A.U-Thai, Ayutthaya 13210

Description : Hot Air Oven
Manufacturer : Memmert
Model : UF260
Serial No. : B520.0814
Identification No. : WWL 0212
Calibration Place : Customer Laboratory

Order No. : 1011/25
Received date : Mar 25, 2025
Calibration date : Mar 20, 2025
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 :

Instrument	Model	Serial No.	Certificate No.	Due Date
LXI Data Acquisition Switch Unit with Sensor	34972A	MY49028922	MT24-8770	Nov 22, 2025

The effect that the result relate only to the items calibrated. It 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 expanded 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.Yuttakorn Jamneansri

Approved by :

(Mr.Panuwat Phukian)
Issue date : Mar 28, 2025

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Certificate No. : MT25-3161

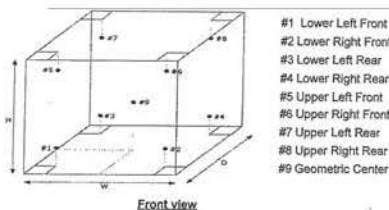
Page : 2 of 2

Function : Temperature measurement
Calibration point : 104, 180 °C

Result : Without adjustment
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	103.767	103.648	104.174	103.965	104.090	104.047	104.160	103.891	104.264	0.32
180	179.673	179.787	179.782	179.908	179.691	179.615	179.920	179.806	179.752	0.50

Setting temperature (°C)	Indicating Temperature (°C)	Measured stability (± °C)	Measured uniformity (°C)	Overall variation (°C)
104.0	104.0 to 104.2	0.13	0.75	0.80
180.0	180.0 to 180.3	0.39	0.88	0.81



- #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.

-oOo-



Certificate No.: C01243793

Page: 2 of 2

Calibration Results:

Without Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

Nominal Test Value	Reference Points (g)				
	A	B	C	D	E
100	0.0001	0.0000	-0.0002	-0.0001	

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
20	0.00005
200	0.00006

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
1	1.00001	1.0000	0.0000	0.00011	2.04
2	2.00001	2.0000	0.0000	0.00011	2.04
5	5.00001	5.0000	0.0000	0.00011	2.04
10	10.00001	10.0000	0.0000	0.00011	2.04
20	20.00001	20.0000	0.0000	0.00012	2.03
50	50.00000	50.0000	0.0000	0.00013	2.02
70	70.00001	70.0001	0.0001	0.00016	2.01
100	99.99996	100.0001	0.0001	0.00017	2.01
120	119.99997	120.0001	0.0001	0.00021	2.00
150	149.99996	150.0002	0.0002	0.00024	2.00
200	199.99989	200.0007	0.0008	0.00030	2.00

The End of Certificate



Certificate of Calibration

Equipment: Balance
Model: BL210S
Serial No. (or ID.): 15808131 (WWL 0022)
Manufacturer: Sartorius
Condition: In condition
Certificate No.: C01243793
Issued Date: 06 December 2024
Job No.: WO-00053756
Page: 1 of 2

Customer: Water Analysis Center Co., Ltd.
1/94 Moo 5, Rojana Industrial Park, Rojana Road,
Tambol Kanham, Amphur U-Thai, Ayutthaya 13210 Thailand

Environment Condition: Temperature 24 °C ± 0.9 °C
Humidity 53 %RH ± 1.3 %RH

Calibration Place: Water Analysis Center Co., Ltd. (ห้องเครื่องชั่ง)
1/94 Moo 5, Rojana Industrial Park, Rojana Road,
Tambol Kanham, Amphur U-Thai, Ayutthaya 13210 Thailand

Calibration By: Mr. Apiwit Chaosap
Calibration Date: 04 December 2024
The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02241786

(Mr. Apiwit Chaosap)

Person in charge

(Mr. Adisai Maknoi)

Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

บริษัท เทคโนโลยี จำกัด
DKSH Technology Limited
2533 สุขุมวิท ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/certification-thailand

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CAL-FM-C01-14: 12 Sep 2022



บริษัท ไทยยูนิค จำกัด THAI UNIQUE CO., LTD.

80-82 ถนนประชาภิบาล แขวงบางขุนพรหม เขตพระนคร กรุงเทพฯ 10200
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Tel. 0-2629-0191-6, 0-2280-1787, Fax. 0-2280-1788, E-mail: thawan@thaiunique.com, Website: www.thaiunique.com

PREVENTATIVE MAINTENANCE (PM) CHECK LIST

FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: 240FS AA & M418230004
Customer: Water analysis center Co., Ltd.
Date: 25 Apr 2024

Safety

- ☒ Flame, Inspect/replace o-ring nebulizer, spray chamber and burner
- ☒ Flame, Clean nebulizer, spray chamber and burner
- ☒ Flame, Check liquid trap interlock, burner interlock, pressure relief bung interlock and shield interlock
- ☐ Furnace, Clean work head, electrode and shroud N/A
- ☐ Furnace, Clean PSD and PSD tray N/A
- ☐ Furnace, Check water pressure N/A
- ☒ Check drain tube
- ☒ Check exhaust system
- ☒ Check gas pressure sensor interlock
- ☒ Check and all gas hoses for SpectraAA
- ☒ Clean computer control

Optics

- ☒ Inspect/Replace that external optics surfaces
- ☒ Check Wavelength Accuracy the copper line at 323.0-326.0 nm = 324.7 nm
- ☒ Check that PMT % Gain the copper at 324.8 nm, 4 mA, 0.5 nm slit width, Gain = 29.7% (should be ≤ 64% or ≤ 380V)
- ☒ Flame, Check D2 lamp is work

Electronics

- ☒ Check power supply voltage
- ☒ Check cables and connectors
- ☒ Check/Clean all boards in the instrument
- ☐ Furnace, Check camera and align** N/A

**Option for Graphite Zeeman only

Mechanisms

- ☒ Flame, Check the burner adjuster
- ☐ Furnace, Check PSD accessories N/A

Analytical performance

- ☒ Clear the sample compartment
- ☒ Flame, Check uptake rate form 7.2-10.6 mL per minute = 8.5 mL/min
- ☒ Test Photometric noise, STDV = 0.0001 Abs (should be ≤ 0.00050 Abs)
- ☒ Flame, Test high solids nebulizer setting use
- Air/acetic Cu 5 ppm = 0.79 Abs, and Precision
- (%RSD) = 0.4 % (should be > 0.55 Abs and $< 0.5\%$ RSD)
- or
- N2O/Acet Cu 5 ppm = _____ Abs, and Precision
- (%RSD) = _____ % (should be > 0.3 Abs and $< 0.5\%$ RSD)
- ☐ Furnace, Characteristic mass and sensitivity Cu 25 ppb = _____ Abs, and N/A
- Precision (%RSD) = _____ % (should be ≥ 0.15 Abs and $\leq 4.0\%$ RSD)

SIGN :

Engineer : Suriya Nacharoen

Customer : นพพร นพพร

2/2

PREVENTATIVE MAINTENANCE (PM) CHECK LIST

FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: 2402 AA & M918230004

Customer : Water Analysis Center Co., Ltd.

Date: 26 Apr 2024

Safety

- ☐ Flame, Inspect/replace o-ring nebulizer, spray chamber and burner N/A
- ☐ Flame, Clean nebulizer, spray chamber and burner N/A
- ☐ Flame, Check liquid trap interlock, burner interlock, pressure relief bung interlock and shield interlock N/A
- ☒ Furnace, Clean work head, electrode and shroud
- ☒ Furnace, Clean PSD and PSD tray
- ☒ Furnace, Check water pressure
- ☒ Check drain tube
- ☒ Check exhaust system
- ☒ Check gas pressure sensor interlock
- ☒ Check and all gas hoses for SpectraAA
- ☒ Clean computer control

Optics

- ☒ Inspect/Replace that external optics surfaces
- ☒ Check Wavelength Accuracy the copper line at 323.0-326.0 nm = 324.7 nm
- ☒ Check that PMT % Gain the copper at 324.8 nm, 4 mA, 0.5 nm slit width, Gain = 90 % (should be $\leq 64\%$ or $\leq 380V$)
- ☐ Flame, Check D2 lamp is work N/A

1/2

Electronics

- ☒ Check power supply voltage
- ☒ Check cables and connectors
- ☒ Check/Clean all boards in the instrument
- ☒ Furnace, Check camera and align**

**Option for Graphite Zeeman only

Mechanisms

- ☐ Flame, Check the burner adjuster N/A
- ☒ Furnace, Check PSD accessories

Analytical performance

- ☒ Clear the sample compartment
- ☐ Flame, Check uptake rate form 7.2-10.6 mL per minute = _____ mL/min N/A
- ☒ Test Photometric noise, STDV = 0.0002 Abs (should be ≤ 0.00050 Abs)
- ☐ Flame, Test high solids nebulizer setting use N/A
- Air/acetic Cu 5 ppm = _____ Abs, and Precision
- (%RSD) = _____ % (should be > 0.55 Abs and $< 0.5\%$ RSD)
- or
- N2O/Acet Cu 5 ppm = _____ Abs, and Precision
- (%RSD) = _____ % (should be > 0.3 Abs and $< 0.5\%$ RSD)
- ☒ Furnace, Characteristic mass and sensitivity Cu 25 ppb = 0.16 Abs, and
- Precision (%RSD) = 3 % (should be ≥ 0.15 Abs and $\leq 4.0\%$ RSD)

SIGN :

Engineer : Suriya Nacharoen

Customer : นพพร นพพร

2/2

PREVENTATIVE MAINTENANCE (PM) CHECK LIST

FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: AA240FS & AA 0911M073

Customer : Water Analysis Center Co., Ltd.

Date: 11 Feb 2025

Safety

- ☒ Flame, Inspect/replace o-ring nebulizer, spray chamber and burner
- ☒ Flame, Clean nebulizer, spray chamber and burner
- ☒ Flame, Check liquid trap interlock, burner interlock, pressure relief bung interlock and shield interlock
- ☐ Furnace, Clean work head, electrode and shroud N/A
- ☐ Furnace, Clean PSD and PSD tray N/A
- ☐ Furnace, Check water pressure N/A
- ☒ Check drain tube
- ☒ Check exhaust system
- ☒ Check gas pressure sensor interlock
- ☒ Check and all gas hoses for SpectraAA
- ☒ Clean computer control

Optics

- ☒ Inspect/Replace that external optics surfaces
- ☒ Check Wavelength Accuracy the copper line at 323.0-326.0 nm = 324.7 nm
- ☒ Check that PMT % Gain the copper at 324.8 nm, 4 mA, 0.5 nm slit width, Gain = 54 % (should be $\leq 64\%$ or $\leq 380V$)
- ☒ Flame, Check D2 lamp is work

1/2

Electronics

☒ Check power supply voltage

☒ Check cables and connectors

☒ Check/Clean all boards in the instrument

☐ Furnace, Check camera and align** N/A

**Option for Graphite Zeeman only

Mechanisms

☒ Flame, Check the burner adjuster

☐ Furnace, Check PSD accessories N/A

Analytical performance

☒ Clear the sample compartment

☒ Flame, Check uptake rate form 7.2-10.6 mL per minute = 9.5 mL/min

☒ Test Photometric noise, STDV = 0.0001 Abs (should be ≤ 0.00050 Abs)

☒ Flame, Test high solids nebulizer setting use

-Air/acetic Cu 5 ppm = 0.80 Abs, and Precision

(%RSD)= 0.2 % (should be > 0.55 Abs and $< 0.5\%$ RSD)

or

-N2O/Acet Cu 5 ppm = _____ Abs, and Precision

(%RSD)= _____ % (should be > 0.3 Abs and $< 0.5\%$ RSD)

☐ Furnace, Characteristic mass and sensitivity Cu 25 ppb = _____ Abs, and N/A

Precision (%RSD)= _____ % (should be ≥ 0.15 Abs and $\leq 4.0\%$ RSD)

SIGN :

Engineer : Saniga Mahachareon Customer : นางสาว อรุณ

2/2

BSC Certification Test Report

Page 1 of 6

Certificate No. : M1439/24

Customer Name : LABORATORY WATER ANALYSIS CENTER COMPANY LIMITED

Customer Address : 1/94 Moo 5 Khan Ham Subdistrict,
 Uthai District, Phra Nakhon Si Ayutthaya 13210

Equipment : Biological Safety Cabinet **Class** II **Type** A2

Manufacturer : Microtech

Model : V6-T

Serial No. : 0972k097272

ID No. : WWL 0084

Were in accordance with ☒ EN 12469 ☐ NSF 49 ☐ Manufacturer's specification

Test Date : 15/10/2024

Due Date : 15/10/2025 **or after HEPA filters are replaced or unit is moved**

Test by : Mr. Pawut Wongnarakornkul

Approved by :

(Mr.Krudsada Thinhutaoei)
 Authorized Signatory

Issued Date : 16/10/2024

This calibration certificate documents the traceability to national standards, which realize the unit of measurement according to the International System of Units (SI).

This certificate may not be reproduced other than in full except with the prior written approval of the Megafil Company Limited.

Megafil Co.,Ltd.

MG-FM-7.8-001, R00 (01/07/19)

Page 2 of 6

Certificate No. : M1439/24

Procedure Used :

- European Standard EN12469 : 2000 has the status of British Standard, Biotechnology Performance criteria for microbiological safety cabinets.
- NSF International Standard / American National Standard NSF / ANSI 49-2008 Biosafety Cabinet : Design, Construction, Performance and Field Certification.
- Australian Standard : AS 1807.23-2000 Determination of intensity of radiation from germicidal ultraviolet lamps.
- Manufacturer's specification.

1. Downflow velocity test.

Measurement Information

No. of Rows	No. of Readings	Grid Spacing Front-Back	Grid Spacing Side-Side	Probe height Above sash
2	8	1/4,3/4	1/8,3/8	100mm

Measurement Data. (m/s.)

0.37	0.43	0.41	0.39
0.36	0.35	0.32	0.34

Average velocity 0.37 m/s (73 FPM.) Velocity range 0.25-0.50 m/s (49-98 FPM.)

Uniformity(EN: +/-20%avg.) 0.30 - 0.44 m/s (58 - 88 FPM.)

Supply filter dimension 24 x 72 (inch x inch) Supply filter area 10.69 SQ.FT

Downflow volume (Q) 780 CFM.

Result Summary ☒ Pass ☐ Fail

Equipment used : Thermo Anemometer **Model** 425 **S/N :** 02968605 **Calibration date :** 10/05/2024

Page 3 of 6

Certificate No. : M1439/24

2. Inflow velocity test.

Select method. : ☐ DIM ☒ Exhaust velocity. ☐ MFG's Specifications

MFG's Specifications method

0.54	0.57	0.55	0.54	0.55
0.56	0.55	0.56	0.57	0.54
0.59	0.53	0.54	0.57	0.56
0.53	0.6	0.56	0.55	0.58
0.55	0.58	0.54	0.53	0.55

(m/s.)

Average Inflow velocity 0.47 m/s (93 FPM.) Velocity range ≥ 0.40 m/s (≥ 79 FPM.)

Inflow dimension 8 x 72 (inch x inch) Inflow area 4.00 SQ.FT

Inflow volume(Q) 372 CFM

Result Summary ☒ Pass ☐ Fail

Adjustments Required ☐ Fan Speed ☐ Damper

Equipment used : Thermo Anemometer **Model** 425 **S/N :** 02968605 **Calibration date :** 10/05/2024

3. HEPA filter leak test.

Measurement Data

HEPA Filter	PAO Upstream Conc.(calculated)	Specification	Measured leak penetration
Supply HEPA Filter	18 μ g/l.	<0.01%	<0.01%
Exhaust HEPA Filter	18 μ g/l.	<0.01%	<0.01%

Certificate No. : M1439/24

Leak location

Supply HEPA Filter
Back

Exhaust HEPA Filter
Back

Result Summary ☒ Pass ☐ Fail

Equipment used : Aerosol Photometer **Model** TDA-2H **S/N :** 20138 **Calibration date :** 08/05/2024

Equipment used : Smoke Generator **Model** TDA-6C **S/N :** 20192

4. Airflow smoke patterns test
Measurement Information

- Downflow Pattern test : Smoke shall be passed from one end of the cabinet to the other, along the centerline of the work surface, at a height of 4 inch (10 cm) above the top of the access opening
- View screen retention test : Smoke shall be passed from one end of the cabinet to the other, 1.0 in (2.5 cm) behind the view screen, at a height 6.0 inch (15 cm) above the top of the access opening.
- Work opening edge retention test : Smoke shall be passed along the entire perimeter of the work opening. Particular attention should be paid to corners and vertical edges.
- Sash/window seal test : Smoke shall be passed up the inside of the window 2 in (5 cm) from the sides and along the top of the work area.

Certificate No. : M1439/24

Result Summary

Downflow Pattern test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming
View screen retention test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming
Work opening edge retention test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming
Sash/window seal test	<input checked="" type="checkbox"/> Accept	<input type="checkbox"/> Non-Conforming

5. Site installation

Sash Alarm.	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A
Interlock System.	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A
Exhaust System Performance	<input type="checkbox"/> Pass	<input type="checkbox"/> Fail	<input checked="" type="checkbox"/> N/A

Remark / Recommendation

ระบบ Site installation ไม่มีการตรวจสอบ เนื่องจากตู้ไม่มีฟังก์ชันนี้

6. Illumination Test (Lighting) : Option

Lighting should be adequate for safe working within the cabinet. Illumination measured at the work surface.

Lux

585	936	917	514
849	1400	1465	755

Equipment used : Digital Light Meter **Model** Easy View 31 **S/N :** 160404993 **Calibration date :** 08/05/2024

Remark :

Certificate No. : M1439/24

7. Ultraviolet Lamp Test (UV) : Option

Ultraviolet radiation where UV Lamp are fitted, the intensity of radiation at a wavelength of 254 nm.
Shall be not less than 400 mW/m² when measures at work floor surface.

mW/m²

630	1450	1480	690
380	920	930	390

Equipment used : UVC LIGHT METER **Model** UVC-254SD **S/N :** Q879819 **Calibration date :** 08/05/2024

Remark :

Certificate of Calibration

LIQUID BATH


Page 1 of 3

Certificate No.: MC 2413808

Customer : Water Analysis Center Co., Ltd.
1/94 Moo 5, T.Kantham, A.U.-Thai, Ayutthaya 13210.

Reference Job No. : 24-2841 **Received Date :** 16 December 2024
Description : Water Bath **Resolution :** 0.1 °C
Manufacturer : ESSTELL **Model :** EWB-122D
Serial No. : 20180508122 **ID. No. :** WWL 0214
Marking : Additionally for the purpose of identification by this laboratory a label marked with this certificate number (MC 2413808) has been attached to the case.
Method : In-House calibration procedure MWI-T-029 this method is base on ASTM E 715-2007 "Liquid Bath".
Location of Calibration : Water Analysis Center Co., Ltd. ; Laboratory.
Environmental Conditions : Ambient Temperature : (25.2 to 25.6) °C
Relative Humidity : (49.0 to 51.0) %
Date of Calibration : 16 December 2024 **Date of Issue :** 18 December 2024

Checked by : Chalermkit Rakphada
(Calibration Engineer)

Approved by : Aittipong Kanjanawong
(Technical Manager)

The uncertainties are for a confidence probability of approximately 95%

This certificate is issued in accordance with the conditions of accreditation granted by the National Standardization Council of Thailand-Office of the National Standardization Council that has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of Master Calibration Co.,Ltd.

Certificate No.: MC 2413808

Page 2 of 3

Reference Standard Instrument :

Description	Certificate No.	Serial No.	Due date	Traceable thru
Data Acquisition/Switch Unit With Thermocouple Type " T " ID. No.27/1 to 27/5	MC 2403566	MY44020009	13 Mar 2025	MCAL

Traceability :

The measurement standard traceable to the international system of units (SI) through certificate as mentioned above

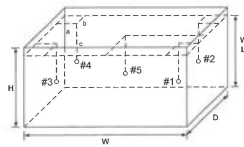
1. Calibration Procedure:

This Instrument was calibration according to ASTM E715 - 2007 by comparison with calibrated sensor under no load condition. The sensor were placed on five points and located one sensor in each of the eight corners of the chamber and was away from the each wall of 5 cm to 10 cm. And placed the five sensor within 2.5 cm of the geometric center of the chamber.

Temperature Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.

Temperature Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.

Overall Variation - The Difference of the maximum and minimum measured temperatures throughout observation.



- Overall Ambient Temperature around the Chamber variation : 1.1 °C
- Overall Line Voltage variation 0.0 V
- Chamber Size (W*H*D) : 50 cm x 12 cm x 30 cm
- Water Level : 7 cm

Checked by : *Chalermit*

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate No.: MC 2413808

Page 3 of 3

2. Result of calibration :

Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations					Uncertainty of measurement (±°C)
	#1	#2	#3	#4	Ref. #5	
45.0	44.6	44.6	44.5	44.5	44.4	0.86

Chamber Characterization Result

Desired Temperature (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
44.5	45.0	45.0	0.85	0.75	1.9

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.0$, providing a level of confidence of approximately 95 %.

This certificate will certify of the calibrated equipment only.

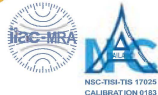
End of Certificate

Checked by : *Chalermit*

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate of Calibration

**TEMPERATURE
CONTROLLER ENCLOSURES**



Page 1 of 3

Certificate No.: MC 2413810

Customer	Water Analysis Center Co., Ltd. 1/94 Moo 5, T.Kantham, A.U.-Thai, Ayutthaya 13210.		
Reference Job No.	24-2841	Received Date	16 December 2024
Description	Incubator	Resolution	0.1 °C
Manufacturer	Memmert	Model	IN260
Serial No.	D619.0170	ID. No.	WWL 0192
Marking	Additionally for the purpose of identification by this laboratory a label marked with this certificate number (MC 2413810) has been attached to the case.		
Method	In-house calibration procedure MWI-T-033 this method Base on TLAS G-20-1/02-08 "Temperature Controlled Enclosures".		
Location of Calibration	Water Analysis Center Co., Ltd. ; Laboratory.		
Environmental Conditions	Ambient Temperature : (23.3 to 24.1) °C Relative Humidity : (54.8 to 64.8) %		
Date of Calibration	16 December 2024	Date of Issue	18 December 2024

Checked by : *Chalermit*
Chalermit Rakphada
(Calibration Engineer)

Approved by : *Aittipong*
Aittipong Kanjina Visit
(Technical Manager)

The uncertainties are for a confidence probability of approximately 95%

This certificate is issued in accordance with the conditions of accreditation granted by the National Standardization Council of Thailand-Office of the National Standardization Council that has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written approval of Master Calibration Co.,Ltd.

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate No.: MC 2413810

Page 2 of 3

Reference Standard Instrument :

Description	Certificate No.	Serial No.	Due date	Traceable thru
Data Acquisition/Switch Unit With RTD ID. No.10/1 to 10/9	MC 2400121	MY39002240	18 Mar 2025	MCAL

Traceability :

The measurement standard traceable to the international system of units (SI) through certificate as mentioned above

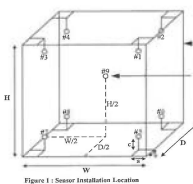
1. Calibration Procedure:

This Instrument was calibration according to TLAS G-20 by comparison with calibrated thermocouple type T under no load condition. The Thermocouples were placed on nine points and located one thermocouple in each of the eight corners of the chamber and was away from the each wall of 5 cm to 10 cm. And placed the ninth thermocouple within 2.5 cm of the geometric center of the chamber.

Temperature Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.

Temperature Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.

Overall Variation - The Difference of the maximum and minimum measured temperatures throughout observation.



- Overall Ambient Temperature around the Chamber variation : 1.2 °C
- Overall Line Voltage variation : 0.1 V
- Chamber Size (W*H*D) : 65 cm x 80 cm x 50 cm

Checked by : *Chalermit*

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

Certificate No.: MC 2413810

Page 3 of 3

2. Result of calibration :

Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty	* Uncertainty does not include stability. (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. #9	(±°C)	
35.0	35.00	35.20	35.00	35.20	34.90	35.00	34.80	34.90	35.00	0.22	0.16

(*) : Non Accredited

Chamber Characterization Result

Desired Temperature (°C)	Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
35.0	35.0	35.0	0.08	0.25	0.50

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.0$, providing a level of confidence of approximately 95 %.

This certificate will certify of the calibrated equipment only.

End of Certificate

Checked by :

Chalermkiet

[MCF-Q-077 ; Rev.6 ; Date : 22/04/2021]

CERTIFICATE OF CALIBRATION

Certificate No. : COF-010-68

Page 1 of 2 Pages

MEASUREMENT ITEM

: Top Load Orifice

MANUFACTURER

: TISCH

MODEL/TYPE

: TE-5028A

SERIAL NUMBER

: 3271

ID NUMBER

: WWU0103

CONDITION AS-RECEIVED

: Used item

CUSTOMER

: Water Analysis Center Co., Ltd
94/1 Moo 5, T.kanham, A.U-thai, Ayutthaya 13210

RECEIVED DATE

: 20 Mar 2025

MEASUREMENT DATE

: 26 Mar 2025

ISSUE DATE

: 26 Mar 2025

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature : 23.0 ± 3.0 °C

Relative Humidity : 55.0 ± 15.0 %RH

Atmospheric Pressure : 1010 ± 10 hPa

CALIBRATION CONDITION:

Preconditioning

: 24 hours at ambient conditions.

Measurement Condition

: The average values during measurement are 23.8 °C and 48.7 %RH.

NOTED: The certificate is valid only to the item calibrated on date and place of calibration.

TABULATION OF RESULTS:

The table on next page give the measured values.



Calibrated by:

☐ Mr. Sorawit Thachalad
☒ Miss Jitraporn Lertsomphol

Approved signatory:

Mr. Parinya Booncharoen

Calibration Department Manager

THIS CERTIFICATE OF CALIBRATION MAY NOT BE REPRODUCED EXCEPT IN FULL UNLESS PERMISSION FOR REPRODUCTION HAS BEEN OBTAINED IN WRITING FROM THE LABORATORY

Continuation of Certificate of Calibration Number COF-010-68

Page 2 of 2 Pages

MEASUREMENT RESULTS:

The Orifice gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Roots Meter). The Humid air was used as a medium in the system. The standard conditions are 25°C (298.15 K) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of Q Standard calibration data

Plate	Flow rate m³/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Ap_meter mmHg	Ap_Office inH₂O	γ	Standard Flow [Qs] m³/min
1	0.704	758.470	23.74	22.68	49.551	1.072	1.037	0.662
2	1.001	758.459	23.62	22.79	35.822	2.271	1.509	0.959
3	1.119	758.482	23.65	22.82	31.313	2.874	1.697	1.079
4	1.166	758.530	23.70	22.95	28.728	3.139	1.774	1.127
5	1.419	758.540	23.73	23.04	17.642	4.843	2.203	1.392

Slope (m): 1.59569
Intercept (b): -0.02154
Correlation coefficient (r): 0.99981
Uncertainty (k=2): 0.015 m³/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m³/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Ap_meter mmHg	Ap_Office inH₂O	γ	Standard Flow [Qs] m³/min
1	0.704	758.470	23.74	22.68	49.551	1.072	0.648	0.660
2	1.001	758.459	23.62	22.79	35.822	2.271	0.943	0.957
3	1.119	758.482	23.65	22.82	31.313	2.874	1.060	1.076
4	1.166	758.530	23.70	22.95	28.728	3.139	1.108	1.124
5	1.419	758.540	23.73	23.04	17.642	4.843	1.377	1.389

Slope (m): 0.99945
Intercept (b): -0.01346
Correlation coefficient (r): 0.99981
Uncertainty (k=2): 0.015 m³/min

End of Certificate of Calibration



SCARLET TECH

Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, test and inspected following the standard calibration procedure (st-wl-21) and is within manufacture's specification at the time when the calibration is don

Client: Water Analysis Center Co., Ltd.

Serial: 2302DR0081 Sensor 2302DT0081

Calibration Date: 2025/3/28

Calibration Expiry Date: 2026/3/27

The Result of Calibration

		Velocity			Result
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance		
1.0	1.0	0.0	0.9-1.1	Pass	
1.9	1.9	0.0	1.8-2.2	Pass	
4.9	5.0	0.1	4.7-5.3	Pass	
7.0	7.1	0.1	6.0-8.0	Pass	
10.0	10.0	0.0	9.5-10.5	Pass	
19.6	19.9	0.3	19.0-21.0	Pass	

		Wind Direction			Result
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance		
48°	47°	1	42-48	Pass	
135°	135°	0	132-138	Pass	
226°	226°	0	222-228	Pass	
316°	316°	0	312-318	Pass	
359°	0°	1	357-3	Pass	

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
22.2°C	22.5	0.3	21.5-23.5	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
1007	1004	3	1001-1019	Pass

Environment Conditions:

Air temperature: 22 °C

Relative humidity: 55 %

Static pressure: 102.2 kPa

Performed by:

Chalermkiet
Certified by Head of Engineering Department

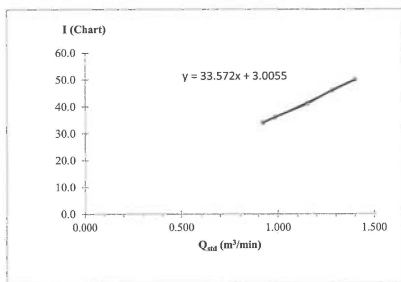


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4F-3, No. 347, 2nd Sec., Heping E. Rd., Daan Dist. Taipei City 106, Taiwan

High Volume Air Sampler Calibration Worksheet

Project Site : สวนอุตสาหกรรมโรจนะอยุธยา (โครงการ 4) Page 1 of 1
Location : วัดชนอน
Date of measurement : 11/11/2025
Worksheet No. : C-111125-WWL0096 Calibration Orifice
High Volume ID : WWL0096 Calibrator ID : WWL0103
High Volume Model : TE-5170 (TSP) Calibrator Model : TE-5028A
High Volume S/N : 2730 Calibrator S/N : 3271
Ambient Condition : Calibrate Date : 26/03/2025
Temperature (°C) : 26 Quality Standard Slope : 1.59569
Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.02154

Test No.	delta H ₂ O (inch)	Q _{ad} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.395	50.0	49.80	Slope : 33.44 Intercept : 2.993 Correlation Coefficient : 0.9990
2	4.10	1.277	46.0	45.81	
3	3.30	1.147	41.0	40.83	
4	2.40	0.980	36.0	35.85	
5	2.10	0.918	34.0	33.86	

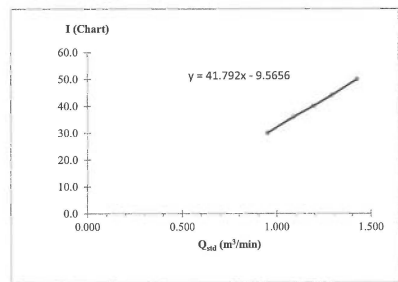


Calibrated by : Approved by :
Mr. JITTAWEE WONGMAKHEEB Mr. RUNGSASIKORN KOSUM
FO.LAB 5.5-1/25 แก้ไขครั้งที่: 1 วันที่บังคับใช้: 1 พ.ค. 2560 หน้า: 1 ของ 1

High Volume Air Sampler Calibration Worksheet

Project Site : สวนอุตสาหกรรมโรจนะอยุธยา (โครงการ 4) Page 1 of 1
Location : วัดชนอน
Date of measurement : 11/11/2025
Worksheet No. : C-111125-WWL0101 Calibration Orifice
High Volume ID : WWL0101 Calibrator ID : WWL0103
High Volume Model : TE-6070 (PM10) Calibrator Model : TE-5028A
High Volume S/N : 2733 Calibrator S/N : 3271
Ambient Condition : Calibrate Date : 26/03/2025
Temperature (°C) : 26 Quality Standard Slope : 0.99945
Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01346

Test No.	delta H ₂ O (inch)	Q _{ad} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.420	50.0	31.44	Slope : 26.28 Intercept : -6.015 Correlation Coefficient : 0.9996
2	4.10	1.287	44.0	27.67	
3	3.50	1.191	40.0	25.15	
4	2.90	1.085	36.0	22.64	
5	2.20	0.947	30.0	18.87	



Calibrated by : Approved by :
Mr. JITTAWEE WONGMAKHEEB Mr. RUNGSASIKORN KOSUM
FO.LAB 5.5-1/25 แก้ไขครั้งที่: 1 วันที่บังคับใช้: 1 พ.ค. 2560 หน้า: 1 ของ 1



Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, test and inspected following the standard calibration procedure (st-wl-21) and is within manufacture's specification at the time when the calibration is done

Client: Water Analysis Center Co., Ltd.
Serial: 2302DR0083 Sensor 2302DT0083
Calibration Date: 2025/3/28
Calibration Expiry Date: 2026/3/27

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1.1	0.1	0.9-1.1	Pass
1.9	2.0	0.1	1.8-2.2	Pass
4.9	5.0	0.1	4.7-5.3	Pass
7.0	7.1	0.1	6.0-8.0	Pass
10.0	10.0	0.0	9.5-10.5	Pass
19.6	20.0	0.4	19.0-21.0	Pass

Wind Direction				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
48°	49°	1	42-48	Pass
135°	135°	0	132-138	Pass
226°	226°	0	222-228	Pass
316°	315°	1	312-318	Pass
359°	0°	1	357-3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
22.2°C	22.5	0.3	21.5-23.5	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
1007	1005	2	1001-1019	Pass

Environment Conditions:
Air temperature: 22 °C
Relative humidity: 55 %
Static pressure: 102.2 kPa

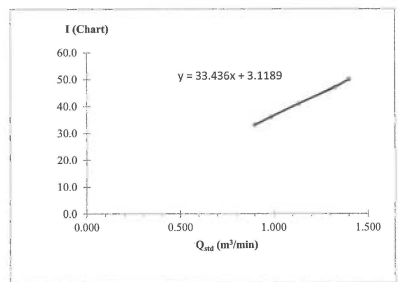
Performed by:
Certified by Head of Engineering Department

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High Volume Air Sampler Calibration Worksheet

Project Site : สวนอุตสาหกรรมโรจนะอยุธยา (โครงการ 4) Page 1 of 1
Location : สวนชนอนน้ำดื่ม
Date of measurement : 11/11/2025
Worksheet No. : C-111125-WWL0094 Calibration Orifice
High Volume ID : WWL0094 Calibrator ID : WWL0103
High Volume Model : TE-5170 (TSP) Calibrator Model : TE-5028A
High Volume S/N : 2736 Calibrator S/N : 3271
Ambient Condition : Calibrate Date : 26/03/2025
Temperature (°C) : 26 Quality Standard Slope : 1.59569
Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.02154

Test No.	delta H ₂ O (inch)	Q _{ad} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.395	50.0	49.80	Slope : 33.30 Intercept : 3.106 Correlation Coefficient : 0.9997
2	4.40	1.323	47.0	46.81	
3	3.20	1.130	41.0	40.83	
4	2.40	0.980	36.0	35.85	
5	2.00	0.896	33.0	32.87	

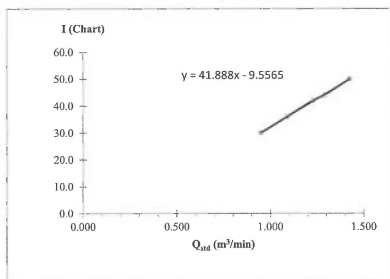


Calibrated by : Approved by :
Mr. JITTAWEE WONGMAKHEEB Mr. RUNGSASIKORN KOSUM
FO.LAB 5.5-1/25 แก้ไขครั้งที่: 1 วันที่บังคับใช้: 1 พ.ค. 2560 หน้า: 1 ของ 1

High Volume Air Sampler Calibration Worksheet

Project Site : ตามอุตสาหกรรมโรจนะอยุธยา (โครงการ 4) Page 1 of 1
Location : อบต.หนองน้ำส้ม
Date of measurement : 11/11/2025
Worksheet No. : C-111125-WWL0099 Calibration Orifice
High Volume ID : WWL0099 Calibrator ID : WWL0103
High Volume Model : TE-6070 (PM10) Calibrator Model : TE-5028A
High Volume S/N : 2732 Calibrator S/N : 3271
Ambient Condition : Calibrate Date : 26/03/2025
Temperature (°C) : 26 Quality Standard Slope : 0.99945
Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01346

Test No.	delta H ₂ O (inch)	Q _{ad} (m³/min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.420	50.0	31.44	Slope : 26.34 Intercept : -6.009 Correlation Coefficient : 0.9995
2	4.10	1.287	44.0	27.67	
3	3.70	1.224	42.0	26.41	
4	2.90	1.085	36.0	22.64	
5	2.20	0.947	30.0	18.87	



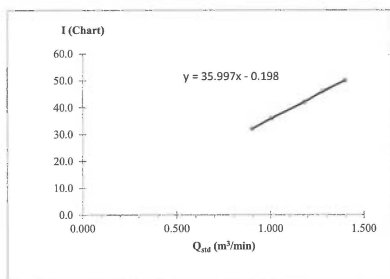
Calibrated by : Mr. JITTAWEE WONGMAKHEB
Approved by : Mr. RUNGSASIKORN KOSUM

FO.LAB 5.5-1/25 แก้ไขครั้งที่: 1 วันที่แก้ไข: 1 ส.ค. 2560 หน้า: 1 ของ 1

High Volume Air Sampler Calibration Worksheet

Project Site : ตามอุตสาหกรรมโรจนะอยุธยา (โครงการ 4) Page 1 of 1
Location : อ.วิเศษบุรีระยอง
Date of measurement : 11/11/2025
Worksheet No. : C-111125-WWL0095 Calibration Orifice
High Volume ID : WWL0095 Calibrator ID : WWL0103
High Volume Model : TE-5170 (TSP) Calibrator Model : TE-5028A
High Volume S/N : 2727 Calibrator S/N : 3271
Ambient Condition : Calibrate Date : 26/03/2025
Temperature (°C) : 26 Quality Standard Slope : 1.59569
Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.02154

Test No.	delta H ₂ O (inch)	Q _{ad} (m³/min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.395	50.0	49.80	Slope : 35.85 Intercept : -0.197 Correlation Coefficient : 0.9996
2	4.10	1.277	46.0	45.81	
3	3.50	1.181	42.0	41.83	
4	2.50	1.000	36.0	35.85	
5	2.00	0.896	32.0	31.87	



Calibrated by : Mr. JITTAWEE WONGMAKHEB
Approved by : Mr. RUNGSASIKORN KOSUM

FO.LAB 5.5-1/25 แก้ไขครั้งที่: 1 วันที่แก้ไข: 1 ส.ค. 2560 หน้า: 1 ของ 1

Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, test and inspected following the standard calibration procedure (st-wl-21) and is within manufacture's specification at the time when the calibration is don

Client: Water Analysis Center Co., Ltd.
Serial: 2302DR0090 Sensor 2302DT0090
Calibration Date: 2025/3/28
Calibration Expiry Date: 2026/3/27

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1.0	0.0	0.9-1.1	Pass
1.9	1.0	0.0	1.8-2.2	Pass
4.9	5.0	0.1	4.7-5.3	Pass
7.0	7.1	0.1	6.0-8.0	Pass
10.0	10.0	0.0	9.5-10.5	Pass
19.6	19.9	0.3	19.0-21.0	Pass

Wind Direction				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
48°	49°	1	42-48	Pass
135°	135°	0	132-138	Pass
226°	226°	0	222-228	Pass
316°	315°	1	312-318	Pass
359°	0°	1	357-3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
22.2°C	22.5	0.3	21.5-23.5	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
1007	1004	3	1001-1019	Pass

Environment Conditions:
Air temperature: 22 °C
Relative humidity: 55 %
Static pressure: 102.2 kPa

Performed by: 
Certified by Head of Engineering Department

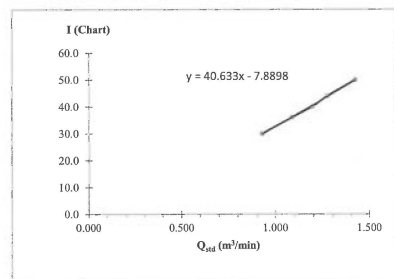
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High Volume Air Sampler Calibration Worksheet

Project Site : ตามอุตสาหกรรมโรจนะอยุธยา (โครงการ 4) Page 1 of 1
Location : อ.วิเศษบุรีระยอง
Date of measurement : 11/11/2025
Worksheet No. : C-111125-WWL0100 Calibration Orifice
High Volume ID : WWL0100 Calibrator ID : WWL0103
High Volume Model : TE-6070 (PM10) Calibrator Model : TE-5028A
High Volume S/N : 2735 Calibrator S/N : 3271
Ambient Condition : Calibrate Date : 26/03/2025
Temperature (°C) : 26 Quality Standard Slope : 0.99945
Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01346

Test No.	delta H ₂ O (inch)	Q _{ad} (m³/min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.420	50.0	31.44	Slope : 25.55 Intercept : -4.961 Correlation Coefficient : 0.9991
2	4.00	1.272	44.0	27.67	
3	3.50	1.191	40.0	25.15	
4	2.90	1.085	36.0	22.64	
5	2.10	0.925	30.0	18.87	



Calibrated by : Mr. JITTAWEE WONGMAKHEB
Approved by : Mr. RUNGSASIKORN KOSUM

FO.LAB 5.5-1/25 แก้ไขครั้งที่: 1 วันที่แก้ไข: 1 ส.ค. 2560 หน้า: 1 ของ 1



Certificate of Calibration

WL-21 Wireless Anemometer

Scarlet Tech Ltd. hereby certifies that the WL-21 wireless anemometer listed below was thoroughly calibrated, test and inspected following the standard calibration procedure (st-wl-21) and is within manufacture's specification at the time when the calibration is done

Client: Water Analysis Center Co., Ltd.
Serial: 2311DR0044 Sensor 2311DT0044
Calibration Date: 2025/3/28
Calibration Expiry Date: 2026/3/27

The Result of Calibration

Velocity				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
1.0	1.0	0.0	0.9-1.1	Pass
1.9	1.9	0.0	1.8-2.2	Pass
4.9	5.0	0.1	4.7-5.3	Pass
7.0	7.1	0.1	6.0-8.0	Pass
10.0	10.0	0.0	9.5-10.5	Pass
19.6	19.9	0.3	19.0-21.0	Pass

Wind Direction				
Measured Value (m/s)	Actual Value (m/s)	Deviation	Tolerance	Result
48°	49°	1	42-48	Pass
135°	135°	0	132-138	Pass
226°	226°	0	222-228	Pass
316°	316°	0	312-318	Pass
359°	0°	1	357-3	Pass

Inspection Room Temp	Actual Value	Deviation	Tolerance	Result
22.2°C	22.5	0.3	21.5-23.5	Pass

Atmospheric Pressure Inspection	Actual Value	Deviation	Tolerance	Result
1007	1004	3	1001-1019	Pass

Environment Conditions:
Air temperature: 22 °C
Relative humidity: 55 %
Static pressure: 102.2 kPa

Performed by:
Certified by Head of Engineering Department

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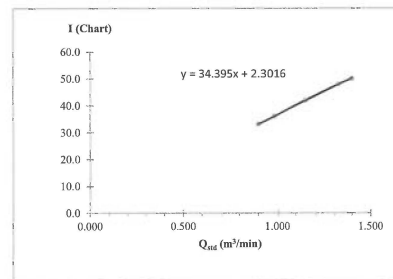


บริษัท ศูนย์วิเคราะห์น้ำ จำกัด
WATER ANALYSIS CENTER COMPANY LIMITED
194 หมู่ 5 ต.คานham อ.อุทัย จ.พระนครศรีอยุธยา 13210
194 Moo 5, T.Kanham, A.U.-Thai, Ayutthaya 13210, Thailand
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-594

High Volume Air Sampler Calibration Worksheet

Project Site :	ตามจุดสหกรณ์โรจนะอยุธยา (โครงการ 4)		Page 1 of 1
Location :	บ้านวังชุมแก้ว		
Date of measurement :	11/11/2025		
Worksheet No. :	C-111125-WWL0097	Calibration Orifice	
High Volume ID :	WWL0097	Calibrator ID :	WWL0103
High Volume Model :	TE-5170 (TSP)	Calibrator Model :	TE-5028A
High Volume S/N :	2726	Calibrator S/N :	3271
Ambient Condition		Calibrate Date :	26/03/2025
Temperature (°C) :	26	Quality Standard Slope :	1.59569
Barometric Pressure (mmHg) :	756	Quality Standard Intercept :	-0.02154

Test No.	delta H ₂ O (inch)	Q _{std} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.395	50.0	49.80	Slope : 34.26 Intercept : 2.292 Correlation Coefficient : 0.9995
2	4.40	1.323	48.0	47.81	
3	3.30	1.147	42.0	41.83	
4	2.40	0.980	36.0	35.85	
5	2.00	0.896	33.0	32.87	



Calibrated by :
Mr. JITTAWEE WONGMAKHEH

Approved by :
Mr. RUNGSASIKORN KOSUM

FO.LAB 5.5-1/25

แก้ไขครั้งที่: 1 วันที่บังคับใช้: 1 ต.ค. 2560 หน้า: 1 ของ 1

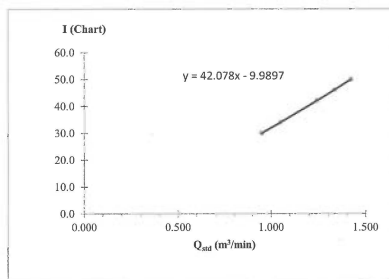


บริษัท ศูนย์วิเคราะห์น้ำ จำกัด
WATER ANALYSIS CENTER COMPANY LIMITED
194 หมู่ 5 ต.คานham อ.อุทัย จ.พระนครศรีอยุธยา 13210
194 Moo 5, T.Kanham, A.U.-Thai, Ayutthaya 13210, Thailand
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-594

High Volume Air Sampler Calibration Worksheet

Project Site :	ตามจุดสหกรณ์โรจนะอยุธยา (โครงการ 4)			Page 1 of 1
Location :	บ้านวังชุมแก้ว			
Date of measurement :	11/11/2025			
Worksheet No. :	C-111125-WWL0102	Calibration Orifice		
High Volume ID :	WWL0102	Calibrator ID :	WWL0103	
High Volume Model :	TE-6070 (PM10)	Calibrator Model :	TE-5028A	
High Volume S/N :	2731	Calibrator S/N :	3271	
Ambient Condition				
Temperature (°C) :	26	Quality Standard Slope :	0.99945	
Barometric Pressure (mmHg) :	756	Quality Standard Intercept :	-0.01346	

Test No.	delta H ₂ O (inch)	Q _{std} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.420	50.0	31.44	Slope : 26.46 Intercept : -6.282 Correlation Coefficient : 0.9998
2	4.40	1.333	46.0	28.93	
3	3.80	1.240	42.0	26.41	
4	2.70	1.047	34.0	21.38	
5	2.20	0.947	30.0	18.87	



Calibrated by :
Mr. JITTAWEE WONGMAKHEH

Approved by :
Mr. RUNGSASIKORN KOSUM

FO.LAB 5.5-1/25

แก้ไขครั้งที่: 1 วันที่บังคับใช้: 1 ต.ค. 2560 หน้า: 1 ของ 1

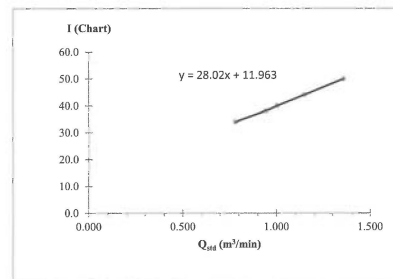


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194 Moo 5, T.Kanham, A.U.-Thai, Ayutthaya 13210, Thailand
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-594

High Volume Air Sampler Calibration Worksheet

Project Site :	ตามจุดสหกรณ์โรจนะอยุธยา (โครงการ 4)		Page 1 of 1
Location :	พื้นที่อาศัยต้นพืชกระถินของโครงการ		
Date of measurement :	11/11/2025		
Worksheet No. :	C-111125-WWL0093	Calibration Orifice	
High Volume ID :	WWL0093	Calibrator ID :	WWL0103
High Volume Model :	TE-5170 (TSP)	Calibrator Model :	TE-5028A
High Volume S/N :	2729	Calibrator S/N :	3271
Ambient Condition		Calibrate Date :	26/03/2025
Temperature (°C) :	26	Quality Standard Slope :	1.59569
Barometric Pressure (mmHg) :	756	Quality Standard Intercept :	-0.02154

Test No.	delta H ₂ O (inch)	Q _{std} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.60	1.352	50.0	49.80	Slope : 27.91 Intercept : 11.915 Correlation Coefficient : 0.9994
2	3.30	1.147	44.0	43.82	
3	2.50	1.000	40.0	39.84	
4	2.20	0.939	38.0	37.85	
5	1.50	0.778	34.0	33.86	



Calibrated by :
Mr. JITTAWEE WONGMAKHEH

Approved by :
Mr. RUNGSASIKORN KOSUM

FO.LAB 5.5-1/25

แก้ไขครั้งที่: 1 วันที่บังคับใช้: 1 ต.ค. 2560 หน้า: 1 ของ 1

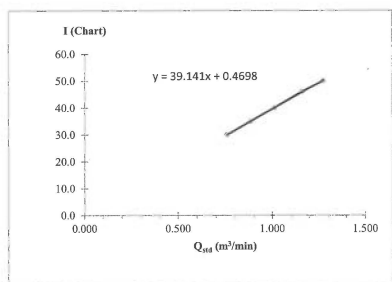


High Volume Air Sampler Calibration Worksheet

Project Site : กรมอุตสาหกรรมโรจนะอยุธยา (โครงการ 4)
Location : ที่ทำการศูนย์วิเคราะห์น้ำออกของโครงการ
Date of measurement : 11/11/2025
Worksheet No. : C-111125-WWL0098 Calibration Orifice
High Volume ID : WWL0098 Calibrator ID : WWL0103
High Volume Model : TE-6070 (PM10) Calibrator Model : TE-5028A
High Volume S/N : 2734 Calibrator S/N : 3271
Ambient Condition :
Temperature (°C) : 26 Calibrate Date : 26/03/2025
Barometric Pressure (mmHg) : 756 Quality Standard Slope : 0.99945
Quality Standard Intercept : -0.01346

Page 1 of 1

Test No.	delta H ₂ O (inch)	Q _{ad} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.00	1.272	50.0	31.44	Slope : 24.61 Intercept : 0.295 Correlation Coefficient : 0.9997
2	3.30	1.156	46.0	28.93	
3	2.50	1.008	40.0	25.15	
4	1.90	0.881	35.0	22.01	
5	1.40	0.758	30.0	18.87	



Calibrated by :

Mr. JITTAWEE WONGMAKHEB

Approved by :

Mr. RUNGSASIKORN KOSUM

FO.LAB 5.5-125

แก้ไขครั้งที่: 1 วันที่แก้ไข: 1 ส.ค. 2560 หน้า: 1 ของ 1



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0342

MTC No. EEL. BP. 56/0468

CALIBRATION CERTIFICATE

Submitted by : WATER ANALYSIS CENTER CO.,LTD.

Address : 1/94 Moo 5, T.Kanham A.U.-Thai, Ayutthaya 13210.

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 : Sound Calibrator

Manufacturer : BSWA TECH

Model : CA111

Serial No. : S20272

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.500) kPa

- Standards used :
1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
 2. Measuring Amplifier Brüel&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 Keithley 2015-P S/N4106495.
 7. Condenser Microphone B&K 4180 S/N 2889871.

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 : 30 Apr. 2025

Date of Calibration : 16 May 2025

1/3

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

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FM.BLMTC.002 Rev.5

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Changwat Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-80 ext. 115, 116
(66) 08 3219 9440
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Office
196 Phahonyothin Road, Ladysao, Chatchuk,
Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
(66) 08 1889 6827



Calibration Test

Calibrated Date: 12 November 2025

Certificate No. 048/25

Instruments Information

Manufacturer : YOUNG Instrument Type : four blade helicoid propeller
Model : CRS10 Serial Number : Logger 14091

Environment : Temperature : 25.5 °C Humidity : 51 %RH

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 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	-	-	-	-	-	0.9	0.07
3.02	-	-	-	-	-	3.0	0.06
5.04	-	-	-	-	-	4.9	0.10
7.03	-	-	-	-	-	6.8	0.23
9.01	-	-	-	-	-	8.8	0.21
11.03	-	-	-	-	-	10.7	0.33
13.01	-	-	-	-	-	12.6	0.41
15.03	-	-	-	-	-	14.6	0.43
17.05	-	-	-	-	-	16.6	0.45
20.02	-	-	-	-	-	19.5	0.52

Wind Aloft Plotting Board.
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU

WIND DIRECTION	TESTED WIND DIRECTION	Deviation	Result
0	0	0	Pass
90	90	0	Pass
180	180	0	Pass
270	270	0	Pass

Calibrate By :
MR. KITTASAK JANSANGWATANA

Approve by :
MR. PASAGORN SAMOL



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0342

MTC No. EEL. BP. 56/0468

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 20µPa at 1000 Hz

Acoustic Output in dB re 20µPa, 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 Brüel&Kjaer 4180	93.73	-0.27	± 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 Brüel&Kjaer 4180	1000.9	0.9	± 1.5	±1.0%

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjaer 4180	2.50	± 0.60	±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 : 16 May 2025

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

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

FM.BLMTC.002 Rev.5

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(66) 08 1889 6827



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0342 MTC No. EEL. BP. 56/0468

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

Acoustic Output in dB re 20µPa, 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 Brüel&Kjaer 4180	113.82	-0.18	± 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 Brüel&Kjaer 4180	1000.9	0.9	± 1.5	±1.0%

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjaer 4180	0.65	± 0.50	±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 Deechaiyai)

Approved by :



(Mr. Praveen Khayap)

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref: 2011268043001729001

Date of Calibration : 16 May 2025

Date of Issue : 16 May 2025

End of Certificate

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FM.BLMTC.002 Rev.5

INNOVATIVE INSTRUMENT CALIBRATION LAB

INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE

7-139 MOO 13, SOI SINTINAKORN 11 TAMBON BANG KAE0.

AMPHOE BANG PHI SAMUT PRAKAN PROVINCE 10540 THAILAN

TEL: (660-2116-5860-1 FAX: (660-2116-7140



INNOVATIVE
INSTRUMENT CO., LTD.



ACCREDITED
CALIBRATION LABORATORY
AC-2961

Page : 1/7

Certificate of Calibration

Customer

Name : WATER ANALYSIS CENTER CO.,LTD.

Certificate No : 25-SLM-062

Address : 1/94 Moo.5, T.Kanham, A.U-Thai, Ayutthaya 13120.

Request No : Req-2025-0456

Unit Under Calibration Details

Measurement item : Sound Level Meter

Microphone Class : 2

Manufacturer : RION

Microphone Model : UC-52

Model : NL-42

Microphone S/N : 180583

Serial Number : 00396801

Preamplifier Model : NH-24

ID : WWL 0159

Preamplifier S/N : 87936

Resolution : 0.1 dB

Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C

Humidity : 50 %RH ± 20 %RH1

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 19 February 2025

Calibrated Date : 24 February 2025

Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests

Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	Brüel & Kjaer	4192	2294985	25 June 2025	NIMT
Audio Generator	Svanitec	Svan401	131	15 October 2025	WK Electric

Note

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

Calibrated By :

Mr. Noppadon Luangart
Service Calibration Engineer

Approved By :

Mr. Pait Mahavorn
Calibration Engineer Supervisor

Issue Date : 24 February 2025

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

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Page : 2/7

Certificate No : 25-SLM-062

Request No : Req-2025-0456

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust UUC (dB)	Before Adjust ERR (dB)	After Adjust UUC (dB)	After Adjust ERR (dB)	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 30-130								
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)	
1000 Hz 114 dB	113.76	113.8	0.04	113.8	+0.04	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN.58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	19.3	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	16.4	0.10
C	18.4	0.10
Z	22.4	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit	Result
FAST / 30-130	A C Z	(± dB)	(± dB)	
STD Setting	(dB) (dB) (dB)	(± dB)	(± dB)	
125 Hz	0.9 1.1 1.0	0.60	1.5	Pass1
1000 Hz	0.0 0.0 0.0	0.60	1.0	Pass
4000 Hz	-0.1 -0.1 -0.1	0.60	3.0	Pass
8000 Hz	-0.9 -0.9 -0.9	0.70	5.0	Pass1

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Page : 3/7

Certificate No : 25-SLM-062

Request No : Req-2025-0456

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve	UNCERTAINTY	Acceptance Limit	Result
FAST / 30-130	A (dB) C (dB) Z (dB)	(± dB)	(± dB)	
STD Setting	(dB) (dB) (dB)	(± dB)	(± dB)	
63 Hz	-0.2 0.0 -0.1	0.20	2.0	Pass
125 Hz	-0.1 0.0 0.0	0.20	1.5	Pass
250 Hz	0.0 0.0 0.1	0.20	1.5	Pass
500 Hz	0.0 0.1 0.0	0.20	1.5	Pass
1000 Hz	0.0 0.0 0.0	0.20	1.0	Pass
2000 Hz	0.0 0.1 0.0	0.20	2.0	Pass
4000 Hz	0.0 0.0 0.0	0.20	3.0	Pass
8000 Hz	0.1 0.1 0.0	0.20	5.0	Pass
16000 Hz	-1.3 -1.3 0.1	0.20	+5, -INF.	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD REF	Measured UUC	Measured ERR	UNCERTAINTY	Acceptance Limit	Result
FAST / 30-130	(dB)	(dB)	(dB)	(± dB)	(± dB)	
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	114.0	0.0	0.20	0.20	Pass
Z	114.00	114.0	0.0	0.20	0.20	Pass

UUC Setting	STD REF	Measured UUC	Measured ERR	UNCERTAINTY	Acceptance Limit	Result
30-130 / A	(dB)	(dB)	(dB)	(± dB)	(± dB)	
UUC Time Response	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Fast	114.00	114.0	0.0	0.20	0.10	Pass1
Slow	114.00	114.0	0.0	0.20	0.10	Pass1
Leq	114.00	114.0	0.0	0.20	0.10	Pass1

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Certificate No : 25-SLM-062
Request No : Req-2025-0456

9. Level linearity including the level range control

3. Level inequality including the leveling collar						
UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance	Result
FAST/ A	REF	UUC	ERR		Limit	
UUC Range	(dB)	(dB)	(dB)		(± dB)	
30-130	30.50	30.6	0.1	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass

8. Level linearity on the reference level range

10. Tone burst response							
UIC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
A / 30-130	Toneburst	Ref	UIC (dB)	ERR (dB)			
UIC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Fast	200	126.0	126.0	0.0	0.20	1.0	Pass
	2	109.0	109.0	0.0		+1.0, -2.5	Pass
	0.25	100.0	99.9	-0.1		+1.5, -5.0	Pass
Slow	200	119.6	119.6	0.0		1.0	Pass
	2	100.0	100.0	0.0		+1.0, -5.0	Pass
	SEL	200	120.0	120.0		0.0	1.0
2		100.0	100.0	0.0		+1.0, -2.5	Pass
0.25		91.0	90.9	-0.1		+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting FAST / C / 55-141	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		REF (dB)	UUC (dB)			
	STD Setting (dB)		ERR (dB)			
Complete cycle	136.4	136.4	0.00	0.20	3.0	Pass
Positive half cycle	135.4	135.1	-0.30		2.0	Pass
Negative half cycle	135.4	135.1	-0.30		2.0	Pass

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Certificate No : 25-SLM-062
Request No : Reg-2025-0456

12. Overload indication

Decision Rule for Statements of Conformity

The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

P₉₅ = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

¹ Pass = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Table 1. The measurement results near and at the limit. However, a value of the expanded uncertainty of measurement at 95% is within the limit.

Fail a The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limits

13. High Level Stability

Upper limit

Measured value

% expanded uncertainty

Nominal

Lower limit

Pass

Fail

Fail

Fail

Note :

Function	Maximum-permitted Uncertainty of measurement
1. Indication at the calibration check frequency	Not applicable
2. Self-generated noise, Microphone installed	Not applicable
3. Self-generated noise, Microphone replaced by the electrical input signal device	Not applicable
4. Acoustic signal test of frequency weightings at 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

- Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-1:2013

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FM-708-SLM-01 Rev.04 Issue date 5/16/20

Certificate No : 25-SLM-063
Request No : Req-2025-0457

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 30-130	UUC		Limit	
STD Setting	(dB)	(± dB)	(± dB)	
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.30	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation	UNCERTAINTY	Acceptances	Result
FAST / A / 30-130	REF	UUC	ERR	Limit	
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)
138.00	138	138.0	0.0	1.1	Pass
134.00	134	134.0	0.0	1.1	Pass
129.00	129	129.0	0.0	1.1	Pass
124.00	124	124.0	0.0	1.1	Pass
119.00	119	119.0	0.0	1.1	Pass
114.00	114	114.0	0.0	1.1	Pass
109.00	109	109.1	0.1	1.1	Pass
104.00	104	104.1	0.1	1.1	Pass
99.00	99	99.1	0.1	1.1	Pass
94.00	94	94.1	0.1	1.1	Pass
89.00	89	89.1	0.1	1.1	Pass
84.00	84	84.1	0.1	1.1	Pass
79.00	79	79.1	0.1	1.1	Pass
74.00	74	74.1	0.1	1.1	Pass
69.00	69	69.1	0.1	1.1	Pass
64.00	64	64.1	0.1	1.1	Pass
59.00	59	59.1	0.1	1.1	Pass
54.00	54	54.1	0.1	1.1	Pass
49.00	49	49.1	0.1	1.1	Pass
44.00	44	44.1	0.1	1.1	Pass
39.00	39	39.1	0.1	1.1	Pass
34.00	34	34.3	0.3	1.1	Pass
29.00	29	29.6	0.6	1.1	Pass
24.00	24	25.0	1.0	1.1	Pass
23.00	23	24.0	1.0	1.1	Pass
22.00	22	23.0	1.0	1.1	Pass

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 25-SLM-063
Request No : Req-2025-0457

9. Level linearity including the level range control

UUC Setting	STD	Measured	UNCERTAINTY	Acceptance	Result
FAST / A	REF	UUC	ERR	Limit	
UUC Range	(dB)	(dB)	(dB)	(± dB)	(± dB)
30-130	27.60	28.5	0.9	1.1	Pass
	114	114.0	0.0	1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured	UNCERTAINTY	Acceptance	Result
A / 30-130	Toneburst	Ref	UUC	ERR	Limit	
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	200	126.0	126.0	0.0	1.0	Pass
	2	109.0	108.9	-0.1	+1.0, -2.5	Pass
	0.25	100.0	99.8	-0.2	+1.5, -5.0	Pass
Slow	200	119.6	119.5	-0.1	1.0	Pass
	2	100.0	99.9	-0.1	+1.0, -5.0	Pass
SEL	200	120.0	120.0	0.0	1.0	Pass
	2	100.0	99.9	-0.1	+1.0, -2.5	Pass
	0.25	91.0	90.8	-0.2	+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured	UNCERTAINTY	Acceptance	Result
FAST / C / 55-141	REF	UUC	ERR	Limit	
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
Complete cycle	136.4	136.0	-0.40	3.0	Pass
Positive half cycle	135.4	135.1	-0.30	2.0	Pass
Negative half cycle	135.4	135.1	-0.30	2.0	Pass

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 25-SLM-063
Request No : Req-2025-0457

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 30-130	UUC		Limit	
STD Setting	(dB)	(± dB)	(± dB)	
Positive one-half cycle	139.3			
Negative one-half cycle	139.3			
Deviated	0.0	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance	Result
FAST / A / 30-130	UUC		Limit	
STD Setting	(dB)	(± dB)	(± dB)	
Initial	129.0			
Final	129.0			
Deviated	0.0	0.10	0.30	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
1. Indication at the calibration check frequency	Not applicable
2. Self-generated noise, Microphone installed	Not applicable
3. Self-generated noise, Microphone replaced by the electrical input signal device	Not applicable
4. Acoustic signal test of frequency weightings at 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1kHz	0.20 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

- Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-1:2013

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FM-708-SLM-01 Rev.04 Issue date 5/6/24

Certificate No : 25-SLM-063
Request No : Req-2025-0457

Decision Rule for Statements of Conformity

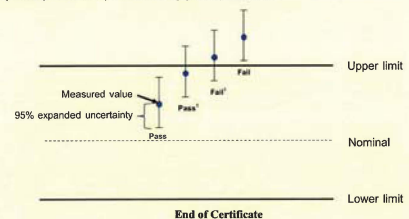
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



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1/94 หมู่ที่ 5 ต.คานหาม อ.อุทัย จ.พระนครศรีอยุธยา 13210

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