
เอกสารสอบเทียบเครื่องมือที่ใช้ในการวิเคราะห์



CERTIFICATE OF CALIBRATION

Certificate No.: CO-1908005/22 Page 1 of total 4 pages

Customer WATER ANALYSIS CENTER CO., LTD.
30/5 Soi Vipavadee 60, Vipavadee Rangsit Road,
Kwaeng Talaebangkhen, Khet Lakai, Bangkok 10210

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 Jayhawk Laboratory (CL&GL)

Received Date 19 August 2022

Calibration Date 19 August 2022

Date of Issue 22 August 2022

Checked by 
Act as Technical Manager

Approved by 
Representative of Managing Director

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

(Dr. Ekachai Puttittwong)

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

FE-169

REV.02 02/24/21



Certificate No.: CO-1908005/22

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	081020	Jan. 22, 2023	NIMT
	7.01	020221	Jan. 18, 2023	
	10.00	091020	Feb. 7, 2023	

Type	Model	Serial No.	Certificate No.	Due Date	Traceability
Documenting Process Calibrator	753	3101007	I0-0804001/22	Apr. 7, 2023	THC
Digital Thermometer with Sensor	1523 / 5622	1709138 / 4605984-005	I0-1006004/22	Jun. 9, 2023	

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	177.4	0.060
0.00	7.00	7.00	0.0	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)

Calibrated by Kittipong
REV.02 02/24/21

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Measurement Results (Cont.):

2. Calibration of pH Electrode (Serial No.: 3322791)

pH Standard Solution (pH)	Measured Value		Uncertainty (± pH)
	(pH)	(mV)	
4.01	4.01	185.9	0.013
7.01	7.01	9.3	0.013
10.00	10.01	-164.9	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%.



Certificate No.: CO-1908005/22

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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	Model	Serial No.	Cert. No.	Due Date	Traceability
Thermometer Readout	1529-R	B7C853	I0-1011001/21	Nov. 10, 2022	THC
Platinum Resistance Thermometer	5626	4854	COA30047	Oct. 22, 2023	FLUKE
Liquid Bath	XORTS-40A	XO111019	I0-0306002/21	Jun. 3, 2023	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	22.0	0.00	0.060
120	25.00	25.0	0.00	0.060
120	28.00	28.0	0.00	0.060

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 -

Calibrated by Kittipong
REV.02 02/24/21

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Calibrated by Pichet
REV.02 02/24/21

CERTIFICATE OF CALIBRATION

Certificate No.: C0-2007006/22 Page 1 of total 2 pages

Customer: WATER ANALYSIS CENTER CO., LTD.
30/5 Soi Viphavadee 60, Viphavadee Rangsit Road,
Kwaeng Taladbangkhon, Khet Laksi, Bangkok 10210

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

Environmental Conditions: Ambient Temperature: $(20 \pm 2) ^\circ\text{C}$
Relative Humidity: $(50 \pm 10) \%$
Atmospheric Pressure: -

Calibration Location: Jayhawk Laboratory (CL&GL)
Received Date: 20 July 2022
Calibration Date: 20 July 2022

Date of Issue: 21 July 2022

Checked by:

Act as Technical Manager

Approved by:

Representative of Managing Director

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

(Dr. Ekachai Puttittwong)

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FE-169 REV.02 02/24/21

Certificate No.: C0-2007006/22

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	151.1 $\mu\text{S}/\text{cm}$ 1.421 mS/cm	S211008031 S220112015	Jan. 18, 2023 May 16, 2023	SCP Science

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

Measurement Results:

Conductivity Standard Solution	Measured Value	Correction	Uncertainty (\pm)
151.1 $\mu\text{S}/\text{cm}$	150.9 $\mu\text{S}/\text{cm}$	0.2 $\mu\text{S}/\text{cm}$	1.5 $\mu\text{S}/\text{cm}$
1.421 mS/cm	1.423 mS/cm	-0.002 mS/cm	0.0052 mS/cm

Note: Adjustment points: 151.1 $\mu\text{S}/\text{cm}$ 1.421 mS/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 -

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

FE-169



AUTOMATION SERVICE CO., LTD.
CALIBRATION LABORATORY

SV 201003/2023

Cert. No. WAC-065
Page 1 of 2

CERTIFICATE OF CALIBRATION

Instrument: DO Meter Machine: -
Model: DO-31P Location: -
Serial No.: 780065
Manufacturer: TOA-DKK
Measuring Range: 0.00 ~ 20.00 mg/l

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

Date Of Received: 05 / 01 / 2023
Date Of Calibration: 05 / 01 / 2023

Ambient Condition: Temperature 25 $^\circ\text{C}$
Humidity 50 % RH

Calibrated By:

(Ms. Phanee Yooyen)
Technician

Approved By:

(Mr. Nipon Phungsomsak)
Technical Manager

Date Of Issue: 09 / 01 / 2023

This Certificate may not be reproduced other than in full, except with the prior written approval of the head of the industrial instruments calibration center.



AUTOMATION SERVICE CO., LTD.
CALIBRATION LABORATORY

Instrument: DO Meter
Model: DO-31P
Serial No.: 780065

Cert. No. WAC-065
Page 2 of 2

Calibrate Procedure

- ☐ This instrument was calibrated by comparison with standard solution (PH/ORP)
☐ This instrument was calibrated by comparison with scattering plate value (Turbidity)
☐ This instrument was calibrated by comparison with conductivity (Conductivity)
☒ This instrument was calibrated by comparison with Sodium sulfite anhydrous (DO)

Condition of this result of calibration

1). Reference Standard Solution

Standard	Lot No	Batch.	Cert. No.	Due Date
Sodium Sulfite Power	1.06657.0500	K54224057	-	30 Sep 2023

2). Traceability This certification is traceable to
☒ Merck KGaA 64271 Darmstadt
☐ DKK Corporation

Result Of Calibration

Standard Solution	Before Adjust	After Adjust
(mg/l) at 24.1 $^\circ\text{C}$	Indicator	Error
Zero	0.05	+0.05
Span	8.25	7.13

DO Electrode No. OE270AA(5) S/N 111F0029

Calibrated By:

(Ms. Phanee Yooyen)
Technician

**TEMPERATURE
CONTROLLER ENCLOSURES**



Certificate No.: MC 2207678

Page 1 of 3

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

Reference Job No. : 22-1601 Received Date : 12 July 2022
Description : Refrigerator
Manufacturer : SANDENINTERCOOL Model : SEC-1500SBD
Serial No. : SEC1500201A-0708-00304 ID. No. : WWL0038
Marking : Additionally for the purpose of identification by this laboratory a label marked with this certificate number (MC 2207678) has been attached to the case.
Method : In-House calibration procedure MWI-T-033 this method is reference to TLAS G-20 "Temperature Controlled Enclosures".
Location of Calibration : Water Analysis Center Co., Ltd.; Laboratory.
Environmental Conditions : Ambient Temperature : (25.8 to 27.5) °C
Relative Humidity : (48.8 to 52.2) %
Date of Calibration : 12 July 2022 Date of Issue : 19 July 2022

Checked by : Thanagorn
Thanagorn Limchaichareon
(Calibration Supervisor)

Approved by : Aittipong
Aittipong Kanjanawasi
(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.

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

Certificate No.: MC 2207678

Page 2 of 3

The Reference Standard :

Description	Certificate No.	Serial No.	Due date
Data Acquisition/Switch Unit	MC 2114432	MY44096104	20 December 2022

With Thermocouple Type "T" ID. No.2/1 to 2/9

This certificate is traceable to the international system of units maintained at:

- Master Calibration Co., Ltd.

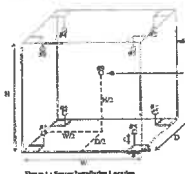
1. Calibration Procedure:

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 : 3.4 °C
Overall Line Voltage variation : 0.1 V
Chamber Size (W*H*D): 171 cm x 157 cm x 60 cm

Checked by : Thanagorn

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

Certificate No.: MC 2207678

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2. Result of calibration :

Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (±°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. #9	
2.5	3.5	3.6	3.7	3.5	3.6	3.4	3.4	3.3	3.4	1.1

Chamber Characterization Result

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (±°C)	Temperature Uniformity (°C)	Overall Variation (°C)
2.0	2.5	1.5	0.6	3.1

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

This report will certify of the calibrated equipment only.

End of Certificate

Checked by : Thanagorn

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

ภาคผนวก ข - 3

Certificate of Calibration

**TEMPERATURE
CONTROLLER ENCLOSURES**



Certificate No.: MC 2303684

Page 1 of 3

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

Reference Job No. : 23-0729 Received Date : 23 March 2023
Description : Oven
Manufacturer : Memmert Model : UF260
Serial No. : B620.0814 ID. No. : WWL0212
Marking : Additionally for the purpose of identification by this laboratory a label marked with this certificate number (MC 2303684) has been attached to the case.
Method : In-House calibration procedure MWI-T-033 this method is reference to TLAS G-20 "Temperature Controlled Enclosures".
Location of Calibration : Water Analysis Center Co., Ltd.; Laboratory.
Environmental Conditions : Ambient Temperature : (27.1 to 29.3) °C
Relative Humidity : (38.0 to 72.2) %
Date of Calibration : 23 March 2023 Date of Issue : 24 March 2023

Checked by : Thanagorn
Thanagorn Limchaichareon
(Calibration Supervisor)

Approved by : Aittipong
Aittipong Kanjanawasi
(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 2303684

Page 2 of 3

The Reference Standard :

Description Certificate No. Serial No. Due date
Data Acquisition/Switch Unit MC 2303173 MY41010916 9 March 2024
With Thermocouple Type "T" ID. No.17/1 to 17/9

This certificate is traceable to the international system of units maintained at:
- Master Calibration Co., Ltd.

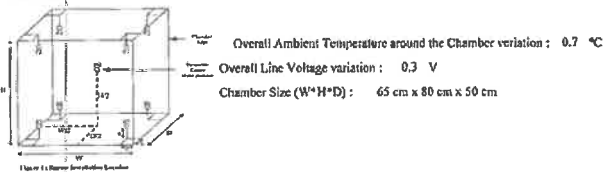
1. Calibration Procedure:

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 this 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.



Certificate No.: MC 2303684

Page 3 of 3

2. Result of calibration :

Temperature Measurement Accuracy Test

Indicating Temperature (°C)	Measured Temperature (°C) at Spread Locations									Uncertainty (°C)
	#1	#2	#3	#4	#5	#6	#7	#8	Ref. #9	
104	103.7	103.9	103.6	103.8	103.7	104.2	104.1	104.2	104.3	0.58
180	179.4	179.8	179.4	179.7	179.4	179.9	179.8	180.2	180.0	1.3

Chamber Characterization Result

Controller Temperature (°C)	Indicating Temperature (°C)	Temperature Stability (°C)	Temperature Uniformity (°C)	Overall Variation (°C)
104	104	0.32	0.84	1.2
180	180	0.4	0.9	1.3

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

This report will certify of the calibrated equipment only.

End of Certificate



Certificate of Calibration

Certificate No.: C01223710

Page: 2 of 2

Equipment: Balance
Model: BL 210S
Serial No. (or ID.): 15808131 (MWL 0022)
Manufacturer: Sartorius
Condition: In condition

Certificate No.: C01223710
Issued Date: 07 December 2022
Job No.: KSPR2215461
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 25 °C ± 0.9 °C
Humidity 48 %RH ± 4.9 %RH

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

Calibration By: Mr. Pradit Siriboot
Calibration Date: 07 December 2022
The Method used: In-house method, CAL-WY-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. C02221864

(Mr. Pradit Siriboot)
Person in charge

(Mr. Rungrod Jenkitrakulchai)
Authorized signatory

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

DKSH Technology Limited
2553 หมู่ 5 ถนนพหลโยธิน แขวงสามยุค กรุงเทพมหานคร 10600

Calibration Results:

Without Adjustment

Excessive 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		100 (g)		100 (g)	
A	B	C	D	E	
-	0.0001	0.0001	-0.0002	-0.0001	

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

Nominal test value (g)	Standard Deviation
20	0.00007
200	0.00007

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	0.00012	2.08
2	2.00001	2.0000	0.0000	0.00012	2.08
5	5.00003	5.0000	0.0000	0.00012	2.07
10	10.00002	10.0000	0.0000	0.00013	2.07
20	20.00001	20.0000	0.0000	0.00013	2.06
50	50.00003	50.0000	0.0000	0.00014	2.04
70	70.00004	70.0001	0.0001	0.00017	2.02
100	100.00002	100.0001	0.0001	0.00018	2.01
120	120.00003	120.0001	0.0001	0.00022	2.01
150	150.00005	150.0003	0.0003	0.00024	2.00
200	200.00006	200.0004	0.0004	0.00030	2.00

The End of Certificate

DKSH Technology Limited
2553 หมู่ 5 ถนนพหลโยธิน แขวงสามยุค กรุงเทพมหานคร 10600

PREVENTATIVE MAINTENANCE (PM) CHECK LIST
FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: 24019 AA X M918200004

Customer: Water Analysis Center Co., Ltd.

Date: 27 Apr 2023

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 SpectrAA
- ☒ Clean computer control

Optics

- ☒ Inspect/Replace that external optics surfaces
- ☒ Check Wavelength Accuracy the copper line at 323.0-326.0 nm = 324.6 nm
- ☒ Check that PMT % Gain the copper at 324.8 nm, 4 mA, 0.5 nm slit width, Gain = 39% (should be $\leq 64\%$ or $\leq 380V$)
- ☒ 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 = 9.8 mL/min
- ☒ Test Photometric noise, STDV = 0.0000 Abs (should be ≤ 0.00050 Abs)
- ☒ Flame, Test high solids nebulizer setting use
- Air/acet Cu 5 ppm = 0.85 Abs, and Precision
- (%RSD) = 0.5 % (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 : Sanya Nakhon

Customer : Water Analysis Center Co., Ltd.

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PREVENTATIVE MAINTENANCE (PM) CHECK LIST
FOR ATOMIC ABSORPTION SPECTROMETER

Model & Serial Number: 2402 AA X M918230004

Customer: Water Analysis Center Co., Ltd.

Date: 26 Apr 2023

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
- ☒ 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 SpectrAA
- ☒ 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 = 42% (should be $\leq 64\%$ or $\leq 380V$)
- ☐ Flame, Check D2 lamp is work N/A

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/acet 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 = 0.49 Abs, and
- Precision (%RSD) = 1.7 % (should be ≥ 0.15 Abs and $\leq 4.0\%$ RSD)

SIGN :

Engineer : Sanya Nakhon

Customer : Water Analysis Center Co., Ltd.

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BSC Certification Test Report

Page 1 of 6

Certificate No. : M01075/22
Customer Name : LABORATORY WATER ANALYSIS CENTER COMPANY LIMITED
Customer Address : 1/94 Moo 5 T.Kanharu, A.U-Thai,
Phra Nakhon Si Ayutthaya 13210
Equipment : Biological Safety Cabinet Class II Type A2
Manufacturer : Microtech
Model : V6-T
Serial No. : 0972
ID No. : WWL0084

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

Test Date : 23/09/2022
Due Date : 23/09/2023 or after HEPA filters are replaced or unit is moved
Test by : Mr. Piyaong Pusua

Approved by : 
(Mr.Kridsada Thinhuafoei)
Authorized Signatory

Issued Date : 26/09/2022

This calibration certificate documents the traceability to national standards, which realizes 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. : M01075/22
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.

0.36	0.42	0.43	0.41
0.40	0.34	0.34	0.33

Average velocity 0.38 m/s (75 FPM.) Velocity range 0.25-0.50 m/s (49-98 FPM.)

Uniformity(EN: +/20% avg.) 0.30 - 0.46 m/s (60 - 90 FPM.)

Supply filter dimension 24 x 72 (inch x inch) Supply filter area 16.69 SQ.FT

Downflow volume (Q) 802 CFM.

Result Summary ☒ Pass ☐ Fail

Equipment used : Thermo Anemometer Model 425 S/N : 02623979 Calibration date : 14/07/2022

Megafil Co.,Ltd.

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

Page 3 of 6

Certificate No. : M01075/22

2. Inflow velocity test.

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

0.53	0.47	0.48	0.50	0.51
0.57	0.46	0.52	0.53	0.50
0.54	0.57	0.55	0.52	0.53
0.53	0.51	0.57	0.54	0.51
0.51	0.48	0.53	0.55	0.56

Average Inflow velocity 0.44 m/s (86 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) 344 CFM

Result Summary ☒ Pass ☐ Fail

Adjustments Required ☐ Fan Speed ☐ Damper

Equipment used : Thermo Anemometer Model 425 S/N : 02623979 Calibration date : 14/07/2022

3. HEPA filter leak test.

Measurement Data

HEPA Filter	PAO Upstream Conc.(calculated)	Specification	Measured leak penetration
Supply HEPA Filter	18 µg/l.	<0.003%	<0.003%
Exhaust HEPA Filter	18 µg/l.	<0.003%	<0.003%

Page 4 of 6

Certificate No. : M01075/22

Leak location

Supply HEPA Filter
Back



Exhaust HEPA Filter
Back



Result Summary ☒ Pass ☐ Fail

Equipment used : Aerosol Photometer Model 21 S/N : 26468 Calibration date 14/07/2022

Equipment used : Smoke Generator Model TDA-6D S/N : 26530

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.

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

Certificate No. : M01075/22

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

ระบุ/ Site installation ไม่มีการตรวจสอบเนื่องจากไม่มีฟังก์ชัน

6. Illumination Test (Lighting) : Option

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

Lux			
620	965	938	561
867	1446	1492	768

Remark :

Certificate No. : M01075/22

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 door surface.

mW/m ²			
720	1510	1540	760
470	980	990	450

Remark :

-000-

THAI METEOROLOGICAL DEPARTMENT
4353 Sukhumvit, Bangna, Bangkok 10260 Tel.081-454-2804,0-2399-0469
Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 15 July, 2022

Certification No. 267/22

Page : 1 of 2

Object : Wireless Weather Station

Manufacturer : Davis Instruments Inc.

Type : Vantage Pro 2 Model No. 6152

Serial No. : BF210508003 ID No. : WIND-05

Customer : BPM ENVIRONMENT CO.,LTD.
124/208 Moo 2, Mahasarak, Bangkruey,
Nonthaburi 11130

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1003.8 hPa

NATIONAL STANDARD WIND TUNNEL :

: Thermal Anemometer 642 S/N 91563


: HOOK GAGE NO 1425 Pilot Tube Theodor Friedrichs Type 0800.0000 serial 9023

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

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

Serial Number 110730029 (sensor 120829586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity m

Calibrated by : 
Mr. Watchapol Subwat
Mechanical Engineer



THAI METEOROLOGICAL DEPARTMENT
4353 Sukhumvit, Bangna, Bangkok 10260 Tel.081-454-2804,0-2399-0469

The Result of Calibration


Certification No. 267/22

15 July, 2022

Page : 2 of 2

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
m/sec	inches H2O	inches H2O	m/sec	m/sec	m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	3.1	-0.08
5.00	-	-	-	4.9	0.10
7.00	-	-	-	7.2	-0.20
9.02	-	-	-	8.9	0.12
11.01	-	-	-	11.2	-0.19
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.2	-0.19
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.2	-0.18

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

Calibrated by : 
Mr. Watchapol Subwat
Mechanical Engineer



Certificate of Calibration

Cal. Date: December 5, 2022
Operator: Jim Tisch
Calibration Model #: TE-5025A
Rootsmeeter S/N: 438320
Ta: 294 °K
Pa: 751.1 mm Hg
Calibrator S/N: 2262

Run	Vol. Inlt (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4280	3.2	2.00
2	3	4	1	1.0110	6.4	4.00
3	5	6	1	0.9000	7.9	5.00
4	7	8	1	0.8570	8.8	5.50
5	9	10	1	0.7080	12.8	8.00

Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pa_{std}} \right) \left(\frac{T_{std}}{T_a} \right)}$ (y-axis)	Va (x-axis)	Qa (y-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pa_{std}} \right) \left(\frac{T_{std}}{T_a} \right)}$ (y-axis)
0.9994	0.9985	1.4154	0.9997	0.6973	0.9648
0.9913	0.9824	2.0017	0.9915	0.9807	1.2513
0.9912	1.1018	2.2380	0.9895	1.0994	1.3990
0.9900	1.1552	2.3472	0.9883	1.1532	1.4673
0.9845	1.3007	2.8308	0.9830	1.3884	1.7695
QSTD	m= 2.04196		m= 1.27864		
	b= -0.00930		b= -0.00581		
	r= 0.99998		r= 0.99998		

Calculations	
Vstd = ΔVol (Pa-ΔP) / Vstd (Tstd/Ta)	Va = ΔVol (Pa-ΔP) / Pa
Qstd = Vstd / ΔTime	Qa = Va / ΔTime
For subsequent flow rate calculations:	
Qstd = 1/n $\left(\sqrt{\Delta H \left(\frac{Pa}{Pa_{std}} \right) \left(\frac{T_{std}}{T_a} \right)} \right)^{-1}$	Qa = 1/n $\left(\sqrt{\Delta H \left(\frac{Pa}{Pa_{std}} \right) \left(\frac{T_{std}}{T_a} \right)} \right)^{-1}$

Standard Conditions
Tstd: 298.15 °K
Pstd: 760 mm Hg
Key
ΔH: calibrator manometer reading (in H2O)
ΔP: rootsmeeter manometer reading (mm Hg)
Ta: actual absolute temperature (°K)
Pa: actual barometric pressure (mm Hg)
b: intercept
m: slope

RECALIBRATION
US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

Tisch Environmental, Inc.
345 South Miami Avenue
Village of Clives, OH 45002

www.tisch-env.com
TOLL FREE: (877)263-7610
FAX: (513)467-9009



Certificate of Calibration

Equipment: Balance
Model: AX205DR
Serial No. (or ID.): 1121501889 (WWL 0154)
Manufacturer: Mettler Toledo
Condition: In condition
Certificate No.: C01223712
Issued Date: 07 December 2022
Job No.: KSPF02215471
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 29 °C ± 0.7 °C
Humidity 60 %RH ± 2.0 %RH

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

Calibration By: Mr. Adinan Nirwiboon
Calibration Date: 07 December 2022
The Method used: In-house method, CAL-WH-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. C02221881

(Mr. Adinan Nirwiboon)
Person in charge

(Mr. Rungrod Juntiratsakul)
Authorized signatory

This certificate is issued on the basis 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 laboratory.
The measurement uncertainty stated in the reported 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, authorized or accepted. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

while measurement is valid only
2023 measurement uncertainty measurement uncertainty 10000
2023 measurement uncertainty measurement uncertainty 10000
2023 measurement uncertainty measurement uncertainty 10000
Phone: +66 2850 7500 Email: info@dksh.com Website: www.dksh.com

Delivering Growth - In Asia and Beyond.




CAL-FM-C01-14: 12 Sep 2022

Certificate No.: C01223712 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	5	(g)
Reference Points (g)					
A	B	C	D	E	
-	0.00000	-0.00003	-0.00005	0.00000	

Repeatability: Determination of the standard deviation of weighing balance. Readability 0.00001 (g)

Nominal test value (g)	Standard Deviation
1	0.000008
10	0.000008

Error of Indication from nominal or conventional mass value. Readability 0.00001 (g)

Nominal Value	Conventional Mass	Displayed Value	Error of Indication	Uncertainty	k
(g)	(g)	(g)	(g)	(g)	
0.001	0.001002	0.00100	0.00000	0.000013	2.09
0.005	0.005001	0.00500	0.00000	0.000013	2.09
0.01	0.010001	0.01000	0.00000	0.000014	2.08
0.05	0.049998	0.05000	0.00000	0.000014	2.08
0.1	0.100003	0.10000	0.00000	0.000015	2.05
0.5	0.500005	0.50000	-0.00001	0.000018	2.02
1	1.000014	1.00001	0.00000	0.000020	2.01
2	2.000018	2.00002	0.00000	0.000022	2.01
5	5.000023	5.00001	-0.00001	0.000028	2.00
10	10.000018	10.00000	-0.00002	0.000035	2.00

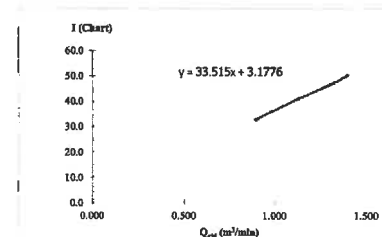
The End of Certificate

บริษัท ศูนย์วิเคราะห์น้ำ จำกัด
WATER ANALYSIS CENTER COMPANY LIMITED
1/94 หมู่ 5 ถนนพหลโยธิน แขวงลาดยาว เขตจตุจักร กรุงเทพมหานคร 13210
1/94 Moo 5, Rojana Industrial Park, Rojana Road, Tambol Kanham, Amphur U-Thai, Ayutthaya 13210, Thailand
Tel: 0-2850-7500 Fax: 0-2850-7500

High Volume Air Sampler Calibration Worksheet

Project Site: ถนนพหลโยธิน แขวงลาดยาว เขตจตุจักร กรุงเทพฯ
Location: จ.ลพบุรี
Date of measurement: 20/4/2023
Worksheet No.: C-200433-WWL0093
High Volume ID: WWL0093
High Volume Model: TS-5170 (TSP)
High Volume S/N: 2729
Ambient Condition: 27.29
Temperature (°C): 35
Barometric Pressure (mmHg): 756
Calibration Office: WWL0103
Calibrator ID: TE-5025A
Calibrator S/N: 3271
Calibrate Date: 11/02/2022
Quality Standard Slope: 1.99945
Quality Standard Intercept: -0.01874

Test No.	delta H ₂ O (inch)	Q _{std} (m³/min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.390	50.0	49.80	Slope: 33.38
2	4.40	1.318	47.0	46.81	Intercept: 3.165
3	3.20	1.126	41.0	40.83	Correlation Coefficient: 0.9995
4	2.40	0.976	36.0	35.85	
5	2.00	0.892	33.0	32.87	



Calibrated by: รุ่งโรจน์
Mr. RATTAPOL BAIKAI
Chemist

Approved by: รุ่งโรจน์
Mr. RUNGROD JUNTIRATSAKUL
Technical Manager

POLAB 3.5-1/23

ฉบับที่: 1 วันที่: 11/02/2022 หน้า: 1 จาก 1

while measurement is valid only
2023 measurement uncertainty measurement uncertainty 10000
2023 measurement uncertainty measurement uncertainty 10000
2023 measurement uncertainty measurement uncertainty 10000
Phone: +66 2850 7500 Email: info@dksh.com Website: www.dksh.com

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CAL-FM-C01-14: 12 Sep 2022

ภาคผนวก ข - 8



บริษัท ศูนย์วิเคราะห์น้ำ จำกัด

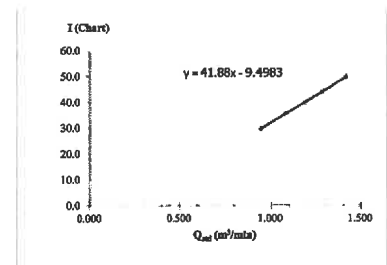
WATER ANALYSIS CENTER COMPANY LIMITED

194 หมู่ 5 ต.สวนทราย อ.ภูธน์ จ.หนองบัวลำภู 32110
194 Moo 5, T.Kasheem, 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 : สวนอุตสาหกรรมโรจนะเขตอุตสาหกรรม
Location : วัดสวนทราย
Date of measurement : 20/4/2023
Worksheet No. : C-200423-WWL0099 Calibration Office : WWL0103
High Volume ID : WWL0099 Calibrator ID : TE-5028A
High Volume Model : TE-6070 (PM10) Calibrator Model :
High Volume S/N : 2732 Calibrator S/N : 3271
Ambient Condition :
Temperature (°C) : 26 Quality Standard Slope : 1.00155
Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01185

Test No.	delta H ₂ O (inch)	Q _{std} (m³/min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.416	50.0	31.44	Slope : 26.34 Intercept : -5.973 Correlation Coefficient : 0.9996
2	4.10	1.283	44.0	27.67	
3	3.50	1.186	40.0	25.15	
4	2.90	1.081	36.0	22.64	
5	2.20	0.943	30.0	18.87	



Calibrated by :

Mr. RATTAPOL BAIKAI
Chemist

Approved by :

Mr. RUNGSASIKORN KOSUM

Technical Management
บันทึกที่ : 1 วันที่รับใช้ : 1 ต.ค. 2560 หน้า : 1 ของ 1

POLAB 5.5-1/25



บริษัท ศูนย์วิเคราะห์น้ำ จำกัด

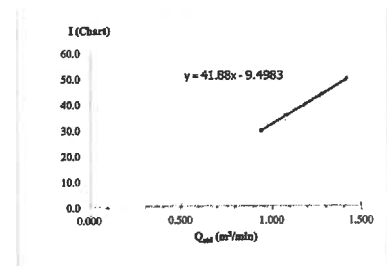
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194 Moo 5, T.Kasheem, A.U-Thai, Ayutthaya 13210, Thailand
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-594

High Volume Air Sampler Calibration Worksheet

Project Site : สวนอุตสาหกรรมโรจนะเขตอุตสาหกรรม
Location : วัดสวนทราย
Date of measurement : 20/4/2023
Worksheet No. : C-200423-WWL0101 Calibration Office : WWL0103
High Volume ID : WWL0101 Calibrator ID : TE-5028A
High Volume Model : TE-6070 (PM10) Calibrator Model :
High Volume S/N : 2733 Calibrator S/N : 3271
Ambient Condition :
Temperature (°C) : 26 Quality Standard Slope : 1.00155
Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01185

Test No.	delta H ₂ O (inch)	Q _{std} (m³/min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.416	50.0	31.44	Slope : 26.34 Intercept : -5.973 Correlation Coefficient : 0.9996
2	4.10	1.283	44.0	27.67	
3	3.50	1.186	40.0	25.15	
4	2.90	1.081	36.0	22.64	
5	2.20	0.943	30.0	18.87	



Calibrated by :

Mr. RATTAPOL BAIKAI
Chemist

Approved by :

Mr. RUNGSASIKORN KOSUM

Technical Management
บันทึกที่ : 1 วันที่รับใช้ : 1 ต.ค. 2560 หน้า : 1 ของ 1

POLAB 5.5-1/25



บริษัท ศูนย์วิเคราะห์น้ำ จำกัด

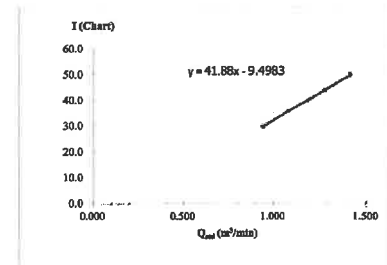
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194 Moo 5, T.Kasheem, A.U-Thai, Ayutthaya 13210, Thailand
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-594

High Volume Air Sampler Calibration Worksheet

Project Site : สวนอุตสาหกรรมโรจนะเขตอุตสาหกรรม
Location : วัดสวนทราย
Date of measurement : 20/4/2023
Worksheet No. : C-200423-WWL0100 Calibration Office : WWL0103
High Volume ID : WWL0100 Calibrator ID : TE-5028A
High Volume Model : TE-6070 (PM10) Calibrator Model :
High Volume S/N : 2735 Calibrator S/N : 3271
Ambient Condition :
Temperature (°C) : 26 Quality Standard Slope : 1.00155
Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01185

Test No.	delta H ₂ O (inch)	Q _{std} (m³/min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.416	50.0	31.44	Slope : 26.34 Intercept : -5.973 Correlation Coefficient : 0.9996
2	4.10	1.283	44.0	27.67	
3	3.50	1.186	40.0	25.15	
4	2.90	1.081	36.0	22.64	
5	2.20	0.943	30.0	18.87	



Calibrated by :

Mr. RATTAPOL BAIKAI
Chemist

Approved by :

Mr. RUNGSASIKORN KOSUM

Technical Management
บันทึกที่ : 1 วันที่รับใช้ : 1 ต.ค. 2560 หน้า : 1 ของ 1

POLAB 5.5-1/25



บริษัท ศูนย์วิเคราะห์น้ำ จำกัด

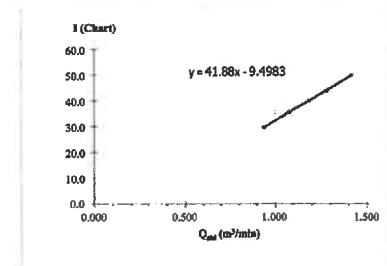
WATER ANALYSIS CENTER COMPANY LIMITED

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194 Moo 5, T.Kasheem, 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 : สวนอุตสาหกรรมโรจนะเขตอุตสาหกรรม
Location : วัดสวนทราย
Date of measurement : 20/4/2023
Worksheet No. : C-200423-WWL0102 Calibration Office : WWL0103
High Volume ID : WWL0102 Calibrator ID : TE-5028A
High Volume Model : TE-6070 (PM10) Calibrator Model :
High Volume S/N : 2731 Calibrator S/N : 3271
Ambient Condition :
Temperature (°C) : 26 Quality Standard Slope : 1.00155
Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01185

Test No.	delta H ₂ O (inch)	Q _{std} (m³/min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.416	50.0	31.44	Slope : 26.34 Intercept : -5.973 Correlation Coefficient : 0.9996
2	4.10	1.283	44.0	27.67	
3	3.50	1.186	40.0	25.15	
4	2.90	1.081	36.0	22.64	
5	2.20	0.943	30.0	18.87	



Calibrated by :

Mr. RATTAPOL BAIKAI
Chemist

Approved by :

Mr. RUNGSASIKORN KOSUM

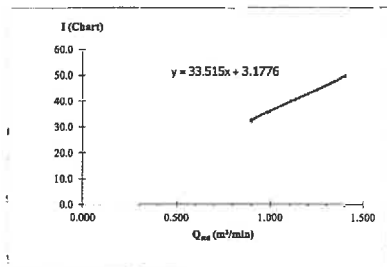
Technical Management
บันทึกที่ : 1 วันที่รับใช้ : 1 ต.ค. 2560 หน้า : 1 ของ 1

POLAB 5.5-1/25

High Volume Air Sampler Calibration Worksheet

Project Site : สถานีอุตสาหกรรมโรงกลั่นสุรา Page 1 of 1
 Location : บ้านหนองน้ำใส
 Date of measurement : 20/4/2023
 Worksheet No. : - Calibration Office : -
 High Volume ID : - Calibrator ID : WWL0103
 High Volume Model : TB-5170 (TSP) Calibrator Model : TE-5025A
 High Volume S/N : 2740 Calibrator S/N : 3271
 Ambient Condition : - Calibrate Date : 11/02/2022
 Temperature (°C) : 26 Quality Standard Slope : 1.59945
 Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01874

Test No.	delta H ₂ O (inch)	Q _{std} (m ³ /min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.390	50.0	49.80	Slope = 33.38 Intercept = 3.165 Correlation Coefficient = 0.9995
2	4.40	1.318	47.0	46.81	
3	3.20	1.126	41.0	40.83	
4	2.40	0.976	36.0	35.85	
5	2.00	0.892	33.0	32.87	



Calibrated by : YTHC

Mr. RATTAPOL BAIKAI

Approved by : ES

Mr. RUNGSASIKORN KOSUM

FO.LAB 55-1/23

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



บริษัท อะตอม-แลบ เอ็นไวรอนเม้นทัล จำกัด
ATOM-LAB ENVIRONMENTAL CO., LTD.
 สำนักงานใหญ่ : 54/110 หมู่ 4, ตำบลบึงกระดี่ อำเภอเมือง จังหวัดสุพรรณบุรี 13100
 Head Office : 54/110 Moo 4, Bang Bua, Amphoe Muang, Pathum Thani 13100
 Tel : 035-226-283 Fax : 035-800-593 E-mail : atomlab@atomlab.com
 สาขา : 194 หมู่ 5 ต.สามพราน อ.พุทธมณฑล จ.นครปฐม 13210
 สาขา : 194 Moo 5, T.Sampran, A.U-Thai, Ayutthaya 13210
 สาขา : 194 Moo 5, T.Sampran, A.U-Thai, Ayutthaya 13210
 สาขา : 194 Moo 5, T.Sampran, A.U-Thai, Ayutthaya 13210

TSP High Volume Sampler Calibration

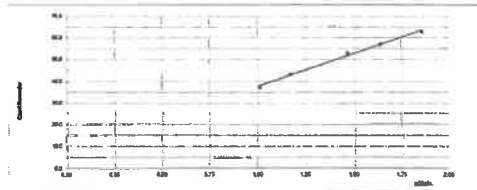
Calibration Report No. TSP-6604001

SITE
 TSP No.: T-01
 Location: บ้านหนองน้ำใส
 Date: 21-Apr-23
 Technical: Savinee K.
 Approval: Sarawut G.

CONDITIONS
 Sea Level Pressure (hPa): 1012.0 Corrected Pressure (mm Hg): 759.1
 Temperature (deg C): 34.5 Temperature (deg K): 307.5
 Seasonal SL Press. (hPa): 1009.1 Corrected Seasonal (mm Hg): 756.9
 Seasonal Temp. (deg C): 19.0 Seasonal Temp. (deg K): 292.0

CALIBRATION ORIFICE
 Make: Jim TISCH
 Model: TB-5025A
 Serial#: 2262
 Qstd Slope: 1.27864
 Qstd Intercept: -0.00591
 Date Certified: 5 Dec 22

CALIBRATIONS					LINEAR REGRESSION
Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	
1	1.70	1.008	38.0	37.39	Slope = 30.0555 Intercept = 7.8583 Corr. coeff = 0.9968
2	2.30	1.171	44.0	43.29	
3	3.60	1.464	54.0	53.13	
4	4.50	1.637	58.0	57.06	
5	5.80	1.858	64.0	62.96	
# of Observations:					5
Range of Chart:					47
at 1.1 - 1.7 m3/min.					\$2



Test by : K. Janyee
 (Savinee Kunatree)

Approved by : S. Sarawut
 (Sarawut Garagad)

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บริษัท อะตอม-แลบ เอ็นไวรอนเม้นทัล จำกัด
ATOM-LAB ENVIRONMENTAL CO., LTD.
 สำนักงานใหญ่ : 54/110 หมู่ 4, ตำบลบึงกระดี่ อำเภอเมือง จังหวัดสุพรรณบุรี 13100
 Head Office : 54/110 Moo 4, Bang Bua, Amphoe Muang, Pathum Thani 13100
 Tel : 035-226-283 Fax : 035-800-593 E-mail : atomlab@atomlab.com
 สาขา : 194 หมู่ 5 ต.สามพราน อ.พุทธมณฑล จ.นครปฐม 13210
 สาขา : 194 Moo 5, T.Sampran, A.U-Thai, Ayutthaya 13210
 สาขา : 194 Moo 5, T.Sampran, A.U-Thai, Ayutthaya 13210
 สาขา : 194 Moo 5, T.Sampran, A.U-Thai, Ayutthaya 13210

TSP High Volume Sampler Calibration

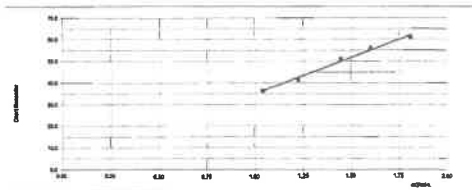
Calibration Report No. TSP-6604002

SITE
 TSP No.: T-02
 Location: บ้านหนองน้ำใส
 Date: 21-Apr-23
 Technical: Savinee K.
 Approval: Sarawut G.

CONDITIONS
 Sea Level Pressure (hPa): 1012.0 Corrected Pressure (mm Hg): 759.1
 Temperature (deg C): 34.7 Temperature (deg K): 307.5
 Seasonal SL Press. (hPa): 1009.1 Corrected Seasonal (mm Hg): 756.9
 Seasonal Temp. (deg C): 19.0 Seasonal Temp. (deg K): 292.0

CALIBRATION ORIFICE
 Make: Jim TISCH
 Model: TB-5025A
 Serial#: 2262
 Qstd Slope: 1.27864
 Qstd Intercept: -0.00581
 Date Certified: 5 Dec 22

Plate or Test #	H2O (in)	CALIBRATIONS				LINEAR REGRESSION
		Qstd (m3/min)	I (chart)	IC (corrected)		
1	1.80	1.037	37.0	36.39	Slope = 33.396 Intercept = 1.8218 Corr. coeff = 0.994	
2	2.50	1.221	42.0	41.21		
3	3.50	1.444	52.0	51.14		
4	4.30	1.600	57.0	56.06		
5	5.50	1.808	62.0	60.98		
# of Observations: 5						
Range of Chart 48						
at 1.1 - 1.7 m3/min. 63						



Test by : K. Janyee
 (Savinee Kunatree)

Approved by : S. Sarawut
 (Sarawut Garagad)

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ATOM-LAB ENVIRONMENTAL CO., LTD.
 สำนักงานใหญ่ : 54/110 หมู่ 4, ตำบลบึงกระดี่ อำเภอเมือง จังหวัดสุพรรณบุรี 13100
 Head Office : 54/110 Moo 4, Bang Bua, Amphoe Muang, Pathum Thani 13100
 Tel : 035-226-283 Fax : 035-800-593 E-mail : atomlab@atomlab.com
 สาขา : 194 หมู่ 5 ต.สามพราน อ.พุทธมณฑล จ.นครปฐม 13210
 สาขา : 194 Moo 5, T.Sampran, A.U-Thai, Ayutthaya 13210
 สาขา : 194 Moo 5, T.Sampran, A.U-Thai, Ayutthaya 13210
 สาขา : 194 Moo 5, T.Sampran, A.U-Thai, Ayutthaya 13210

TSP High Volume Sampler Calibration

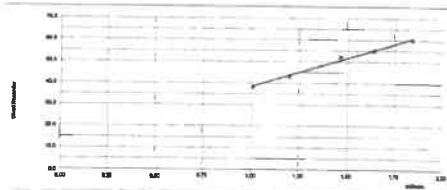
Calibration Report No. TSP-6604003

SITE
 TSP No.: T-03
 Location: บ้านหนองน้ำใส
 Date: 21-Apr-23
 Technical: Savinee K.
 Approval: Sarawut G.

CONDITIONS
 Sea Level Pressure (hPa): 1011.0 Corrected Pressure (mm Hg): 758.3
 Temperature (deg C): 34.3 Temperature (deg K): 307.3
 Seasonal SL Press. (hPa): 1009.1 Corrected Seasonal (mm Hg): 756.9
 Seasonal Temp. (deg C): 19.0 Seasonal Temp. (deg K): 292.0

CALIBRATION ORIFICE
 Make: Jim TISCH
 Model: TB-5025A
 Serial#: 2262
 Qstd Slope: 1.27864
 Qstd Intercept: -0.00581
 Date Certified: 5 Dec 22

CALIBRATIONS					
Plate or Test #	H ₂ O (In)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	1.70	1.008	39.0	38.36	Slope = 26.2847 Intercept = 12.2080 Corr. coeff = 0.9956
2	2.40	1.196	44.0	43.28	
3	3.60	1.464	53.0	52.13	
4	4.50	1.636	56.0	55.08	
5	5.70	1.841	61.0	60.00	
# of Observations:					5
Range of Chart:					46



Test by : K. Janyee
 (Savinee Kunatree)

Approved by : S. Sarawut
 (Sarawut Garagad)

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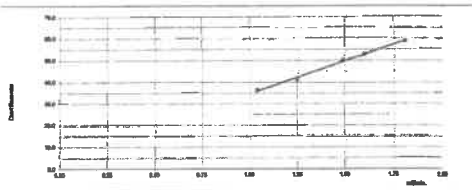
AT0548 ENVIRONMENTAL CULTURE

บริษัท อตอม-แลบ เอ็นไวรอนเม้นทัล จำกัด
ATOM-LAB ENVIRONMENTAL CO., LTD.
ถิ่นเอกชัย 59/19 หมู่ 5 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 10520
Head Office: 59/19 Moo 5, Bang Phli Sub-town, Bang Phli District, Samut Prakan 10520
Tel: 0-2622-343 Fax: 0-2622-593 Email: atomlab@gmail.com
www.atomlab.com (0-2622-593)

TSP High Volume Sampler Calibration

Calibration Report No. TSP-6604004

SITE		Date: 21-Apr-23	
TSP No.: T-04		Technical: Savitree K.	
Location: บ้านสวนอ้อย		Approval: Sarawut G.	
CONDITIONS			
Sea Level Pressure (hPa): 1011.0	Corrected Pressure (mm Hg): 758.3		
Temperature (deg C): 34.3	Temperature (deg F): 93.7		
Seasonal SL Press. (hPa): 1009.1	Corrected Seasonal (mm Hg): 756.9		
Seasonal Temp. (deg C): 19.0	Seasonal Temp. (deg F): 66.2		
CALIBRATION ORIFICE		Qstd Slope: 1.27864	
Make: Jim TISCH		Qstd Intercept: -0.00581	
Model: TE-5025A		Date Certified: 5 Dec 22	
Serial#: 2262			
CALIBRATIONS			
Plate or Test #	H2O (in)	Qstd (m³/min)	I (Chart)
1	1.80	1.036	37.0
2	2.60	1.245	42.0
3	3.70	1.484	51.0
4	4.30	1.599	54.0
5	5.50	1.808	60.0
		IC (Corrected)	
		36.38	
		41.30	
		50.15	
		53.10	
		59.00	
		Slope =	30.1117
		Intercept =	4.7936
		Corr. coeff =	0.9975
		# of Observations:	5
		Range of Chart	45
		at 1.1 - 1.7 m³/min.	60



Test by: K. Savitree (Savitree Kusaree)
Approved by: Sarawut Garagad (Sarawut Garagad)

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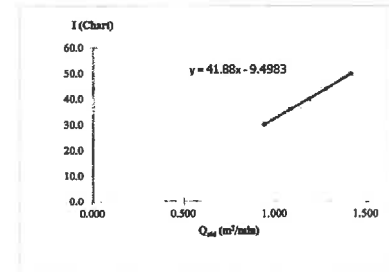
194 หมู่ 5 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 10520
194 Moo 5, T.Bang Phli, A.U-Thai, Ayutthaya 13210, Thailand
Tel: 0-35226-343, 0-35800-593 Fax: 0-35800-594

High Volume Air Sampler Calibration Worksheet

Page 1 of 1

Project Site:	สวนอุตสาหกรรมโรจนะอุตสาหกรรม		
Location:	วัดโคกขาม		
Date of measurement:	20/4/2023		
Worksheet No.:	C-200423-WWL0098	Calibration Orifice:	WWL0103
High Volume ID:	WWL0098	Calibrator ID:	TE-5028A
High Volume Model:	TE-6070 (PM10)	Calibrator Model:	3271
High Volume S/N:	2734	Calibrator S/N:	11/02/2022
Ambient Condition:	26	Quality Standard Slope:	1.00153
Temperature (°C):	756	Quality Standard Intercept:	-0.01183
Barometric Pressure (mmHg):			

Test No.	delta H ₂ O (inch)	Q _{std} (m³/min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.416	50.0	31.44	Slope: 26.34
2	4.10	1.283	44.0	27.67	Intercept: -5.973
3	3.50	1.186	40.0	25.15	Correlation Coefficient: 0.9996
4	2.90	1.081	36.0	22.64	
5	2.20	0.943	30.0	18.87	



Calibrated by: Mr. RATTAPOL BAIKAI (Rattapol Baikai)
Approved by: Mr. RUNGASIKORN KOSUM (Rungasikorn Kosum)

POLAB 5.5-1/25

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



บริษัท ศูนย์วิเคราะห์น้ำ จำกัด
WATER ANALYSIS CENTER COMPANY LIMITED

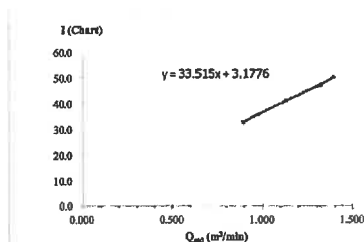
194 หมู่ 5 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 10520
194 Moo 5, T.Bang Phli, A.U-Thai, Ayutthaya 13210, Thailand
Tel: 0-35226-343, 0-35800-593 Fax: 0-35800-594

High Volume Air Sampler Calibration Worksheet

Page 1 of 1

Project Site:	สวนอุตสาหกรรมโรจนะอุตสาหกรรม		
Location:	วัดโคกขาม		
Date of measurement:	20/4/2023		
Worksheet No.:	C-200423-WWL0094	Calibration Orifice:	WWL0103
High Volume ID:	WWL0094	Calibrator ID:	TE-5028A
High Volume Model:	TE-5170 (TSP)	Calibrator Model:	3271
High Volume S/N:	2736	Calibrator S/N:	11/02/2022
Ambient Condition:	26	Quality Standard Slope:	1.59945
Temperature (°C):	756	Quality Standard Intercept:	-0.01874
Barometric Pressure (mmHg):			

Test No.	delta H ₂ O (inch)	Q _{std} (m³/min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.390	50.0	49.80	Slope: 33.38
2	4.40	1.318	47.0	46.81	Intercept: 3.165
3	3.20	1.126	41.0	40.83	Correlation Coefficient: 0.9995
4	2.40	0.976	36.0	35.85	
5	2.00	0.892	33.0	32.87	



Calibrated by: Mr. RATTAPOL BAIKAI (Rattapol Baikai)
Approved by: Mr. RUNGASIKORN KOSUM (Rungasikorn Kosum)

POLAB 5.5-1/25

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



บริษัท ศูนย์วิเคราะห์น้ำ จำกัด
WATER ANALYSIS CENTER COMPANY LIMITED

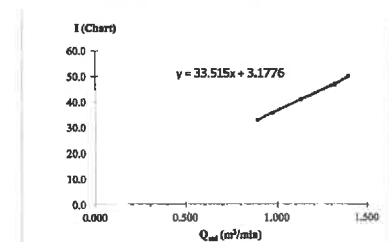
194 หมู่ 5 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 10520
194 Moo 5, T.Bang Phli, A.U-Thai, Ayutthaya 13210, Thailand
Tel: 0-35226-343, 0-35800-593 Fax: 0-35800-594

High Volume Air Sampler Calibration Worksheet

Page 1 of 1

Project Site:	สวนอุตสาหกรรมโรจนะอุตสาหกรรม		
Location:	วัดโคกขาม		
Date of measurement:	20/4/2023		
Worksheet No.:	C-200423-WWL0095	Calibration Orifice:	WWL0103
High Volume ID:	WWL0095	Calibrator ID:	TE-5028A
High Volume Model:	TE-5170 (TSP)	Calibrator Model:	3271
High Volume S/N:	2723	Calibrator S/N:	11/02/2022
Ambient Condition:	26	Quality Standard Slope:	1.59945
Temperature (°C):	756	Quality Standard Intercept:	-0.01874
Barometric Pressure (mmHg):			

Test No.	delta H ₂ O (inch)	Q _{std} (m³/min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.390	50.0	49.80	Slope: 33.38
2	4.40	1.318	47.0	46.81	Intercept: 3.165
3	3.20	1.126	41.0	40.83	Correlation Coefficient: 0.9995
4	2.40	0.976	36.0	35.85	
5	2.00	0.892	33.0	32.87	



Calibrated by: Mr. RATTAPOL BAIKAI (Rattapol Baikai)
Approved by: Mr. RUNGASIKORN KOSUM (Rungasikorn Kosum)

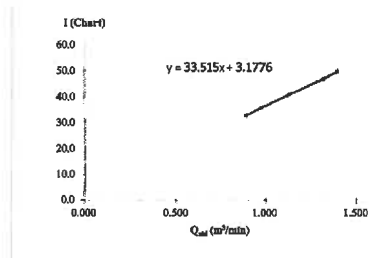
POLAB 5.5-1/25

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

High Volume Air Sampler Calibration Worksheet

Project Site : สถานีอากาศยานนานาชาติ Page 1 of 1
Location : สนามบินดอนเมือง
Date of measurement : 20/4/2023
Worksheet No. : C-300423-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 : 11/02/2022
Temperature (°C) : 26 Quality Standard Slope : 1.59945
Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01874

Test No.	delta H ₂ O (inch)	Q _{del} (m³/min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.390	50.0	49.80	Slope : 33.38 Intercept : 3.165 Correlation Coefficient : 0.9995
2	4.40	1.318	47.0	46.81	
3	3.20	1.126	41.0	40.83	
4	2.40	0.976	36.0	35.85	
5	2.00	0.892	33.0	32.87	



Calibrated by : โศภณ

Approved by : โศภณ

Mr. RATTAPOL BAIKAI
Chemist

Mr. RUNGASAKORN KOSUM
Technical Manager

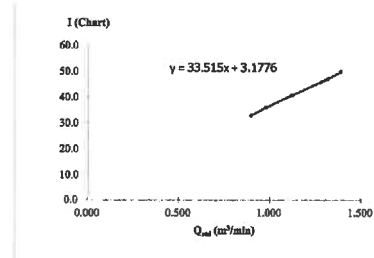
FOLAB 55-105

วันที่ใช้ : 1 ตุลาคม 2566 หน้า : 1 ของ 1

High Volume Air Sampler Calibration Worksheet

Project Site : สถานีอากาศยานนานาชาติ Page 1 of 1
Location : สนามบินดอนเมือง
Date of measurement : 20/4/2023
Worksheet No. : C-300423-WWL0097 Calibration Orifice :
High Volume ID : WWL0097 Calibrator ID : WWL0103
High Volume Model : TE-5170 (TSP) Calibrator Model : TE-5028A
High Volume S/N : 2728 Calibrator S/N : 3271
Ambient Condition : Calibrate Date : 11/02/2022
Temperature (°C) : 26 Quality Standard Slope : 1.59945
Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01874

Test No.	delta H ₂ O (inch)	Q _{del} (m³/min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.90	1.390	50.0	49.80	Slope : 33.38 Intercept : 3.165 Correlation Coefficient : 0.9995
2	4.40	1.318	47.0	46.81	
3	3.20	1.126	41.0	40.83	
4	2.40	0.976	36.0	35.85	
5	2.00	0.892	33.0	32.87	



Calibrated by : โศภณ

Approved by : โศภณ

Mr. RATTAPOL BAIKAI
Chemist

Mr. RUNGASAKORN KOSUM
Technical Manager

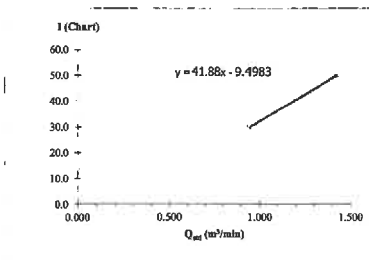
FOLAB 55-105

วันที่ใช้ : 1 ตุลาคม 2566 หน้า : 1 ของ 1

High Volume Air Sampler Calibration Worksheet

Project Site : สถานีอากาศยานนานาชาติ Page 1 of 1
Location : สนามบินดอนเมือง
Date of measurement : 20/4/2023
Worksheet No. : - Calibration Orifice :
High Volume ID : - Calibrator ID : WWL0103
High Volume Model : TE-6070 (PM10) Calibrator Model : TE-5028A
High Volume S/N : 2745 Calibrator S/N : 3271
Ambient Condition : Calibrate Date : 11/02/2022
Temperature (°C) : 26 Quality Standard Slope : 1.00155
Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01185

Test No.	delta H ₂ O (inch)	Q _{del} (m³/min)	I (Chart)	IC (Corrected)	Linear Regression
1	5.00	1.416	50.0	31.44	Slope : 26.34 Intercept : -5.973 Correlation Coefficient : 0.9996
2	4.10	1.283	44.0	27.67	
3	3.50	1.186	40.0	25.15	
4	2.90	1.081	36.0	22.64	
5	2.20	0.943	30.0	18.87	



Calibrated by : โศภณ

Approved by : โศภณ

Mr. RATTAPOL BAIKAI

Mr. RUNGASAKORN KOSUM

FOLAB 55-105

วันที่ใช้ : 1 ตุลาคม 2566 หน้า : 1 ของ 1



บริษัท อะตอม-แลบ เอ็นไวรอนเม้นทัล จำกัด
ATOM-LAB ENVIRONMENTAL CO., LTD.
สำนักงานใหญ่ : 501/10 หมู่ 4 ต.บางนาหน อ.อุบล จ.หนองบัวลำภู 32110
Plant Office : 194/10 Moo 4, Bang Nuan, Nong Bua Lamphu 32110
Tel: 035226343 Fax: 035800593 Email: atomlab@atomlab.com

PM10 High Volume Sampler Verification

Verification Report No. PM-604001

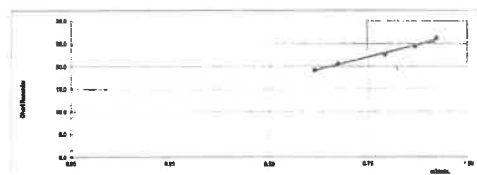
PM-10 No: PM-01 SITE: สนามบินดอนเมือง
Location: สนามบินดอนเมือง

Date: 21-Apr-23
Test: Service IC
Approved: Sarawat G.

CONDITIONS
Sea Level Pressure (hPa): 1012.0 Corrected Pressure (mm Hg): 759.1
Temperature (deg C): 24.5 Temperature (deg F): 307.5
Seasonal SL Press. (hPa): 1009.1 Corrected Seasonal (mm Hg): 756.9
Seasonal Temp. (deg C): 19.0 Seasonal Temp. (deg F): 292.0

CALIBRATION ORIFICE
Make: Jim Tech Slope: 1.27064
Model: TE-5028A Intercept: -0.00581
Serial#: 2262 Date Certified: 5 Dec 22

Plate or Test #	H2O (in)	Q _{del} (m³/min)	I (Chart)	IC (Corrected)	LINEAR REGRESSION
1	1.50	0.614	29.90	19.03	Slope (m)= 21.9744 Intercept (b)= 5.5605 Corr. coeff.(r)= 0.9931 SPR = 1.187 SSP = 49.70 # of Observations: 5 Range of Chart at SPR ±10% 45 53
2	1.80	0.672	32.40	20.62	
3	2.50	0.792	35.50	22.59	
4	3.00	0.867	38.20	24.31	
5	3.40	0.922	41.20	26.22	



Test by : โศภณ
(Sarawat Kusumee)

Approved by : โศภณ
(Sarawat Kusumee)

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ATOM-LAB ENVIRONMENTAL CO., LTD.
สำนักงานใหญ่: 14/10 หมู่ 4 ตำบลบึงเมืองโพธิ์ อำเภอเมือง จังหวัดสุพรรณบุรี 18100
Head Office: 14/10 Moo 4, Bang-Bung-Mueang Sub-town, Phra Pradaeng District, Suphanburi 18100
Tel: 02-999-0249 Fax: 02-999-0248 E-mail: atomlab@atomlab.com
www.atomlab.com

PM10 High Volume Sampler Verification

Verification Report No. PM-6604002

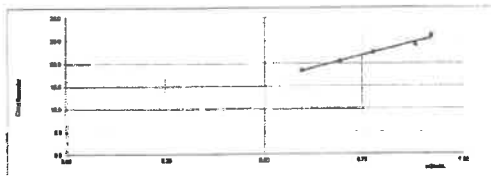
PM-10 No.: PM-02
Location: สุพรรณบุรี

Date: 21-Apr-23
Test: Savinee K.
Approval: Sarawut G.

CONDITIONS
Sea Level Pressure (hPa): 1012.0 Corrected Pressure (mm Hg): 759.3
Temperature (deg C): 34.7 Temperature (deg F): 94.3
Seasonal SL Press. (hPa): 1009.1 Corrected Seasonal (mm Hg): 756.9
Seasonal Temp. (deg C): 19.0 Seasonal Temp. (deg F): 66.2

CALIBRATION ORIFICE
Make: Jim Tisch Model: TB-5025A Serial#: 2262
Slope: 1.27864 Intercept: -0.00581 Date Certified: 5 Dec 22

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	1.40	0.594	22.00	18.46	Slope (m)= 21.8273
2	1.90	0.691	32.20	20.50	Intercept (b)= 5.6390
3	2.40	0.776	35.20	22.41	Corr. coeff(r)= 0.9927
4	3.10	0.881	37.50	24.13	SFR = 1.187
5	3.40	0.923	40.50	26.04	SSP = 49.25
# of Observations:					5
Range of Chart at SFR ±10%					44
					52



Test by
K. Savinee
(Savinee Kunatree)

Approved by
G. Sarawut
(Sarawut Garagad)

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ATOM-LAB ENVIRONMENTAL CO., LTD.
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Head Office: 14/10 Moo 4, Bang-Bung-Mueang Sub-town, Phra Pradaeng District, Suphanburi 18100
Tel: 02-999-0249 Fax: 02-999-0248 E-mail: atomlab@atomlab.com
www.atomlab.com

PM10 High Volume Sampler Verification

Verification Report No. PM-6604003

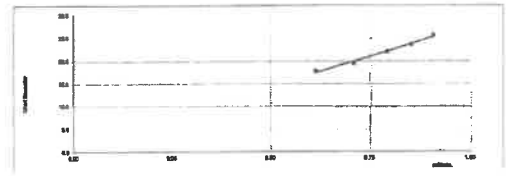
PM-10 No.: PM-03
Location: สุพรรณบุรี

Date: 21-Apr-23
Test: Savinee K.
Approval: Sarawut G.

CONDITIONS
Sea Level Pressure (hPa): 1011.0 Corrected Pressure (mm Hg): 758.3
Temperature (deg C): 34.3 Temperature (deg F): 93.7
Seasonal SL Press. (hPa): 1009.1 Corrected Seasonal (mm Hg): 756.9
Seasonal Temp. (deg C): 19.0 Seasonal Temp. (deg F): 66.2

CALIBRATION ORIFICE
Make: Jim Tisch Model: TB-5025A Serial#: 2262
Slope: 1.27864 Intercept: -0.00581 Date Certified: 5 Dec 22

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	1.50	0.614	28.00	17.82	Slope (m)= 26.9876
2	2.00	0.709	30.00	19.48	Intercept (b)= 0.8506
3	2.50	0.792	34.50	22.15	Corr. coeff(r)= 0.9931
4	2.90	0.852	37.20	23.68	SFR = 1.187
5	3.30	0.909	40.40	25.72	SSP = 51.66
# of Observations:					5
Range of Chart at SFR ±10%					46
					55



Test by
K. Savinee
(Savinee Kunatree)

Approved by
G. Sarawut
(Sarawut Garagad)

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ATOM-LAB ENVIRONMENTAL CO., LTD.
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Head Office: 14/10 Moo 4, Bang-Bung-Mueang Sub-town, Phra Pradaeng District, Suphanburi 18100
Tel: 02-999-0249 Fax: 02-999-0248 E-mail: atomlab@atomlab.com
www.atomlab.com

PM10 High Volume Sampler Verification

Verification Report No. PM-6604004

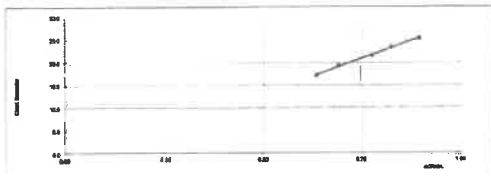
PM-10 No.: PM-04
Location: สุพรรณบุรี

Date: 21-Apr-23
Test: Savinee K.
Approval: Sarawut G.

CONDITIONS
Sea Level Pressure (hPa): 1011.0 Corrected Pressure (mm Hg): 758.3
Temperature (deg C): 34.5 Temperature (deg F): 94.1
Seasonal SL Press. (hPa): 1009.1 Corrected Seasonal (mm Hg): 756.9
Seasonal Temp. (deg C): 19.0 Seasonal Temp. (deg F): 66.2

CALIBRATION ORIFICE
Make: Jim Tisch Model: TB-5025A Serial#: 2262
Slope: 1.27864 Intercept: -0.00581 Date Certified: 5 Dec 22

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	1.40	0.634	22.00	17.19	Slope (m)= 31.2338
2	1.90	0.691	30.40	19.36	Intercept (b)= -2.4659
3	2.40	0.776	33.90	21.59	Corr. coeff(r)= 0.9980
4	2.70	0.823	36.80	23.43	SFR = 1.188
5	3.20	0.895	39.90	25.41	SSP = 54.38
# of Observations:					5
Range of Chart at SFR ±10%					43
					52



Test by
K. Savinee
(Savinee Kunatree)

Approved by
G. Sarawut
(Sarawut Garagad)

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ENVIR SERVICE

42 Ramnithra 14 year 9, Tha Raeng, Bangkok, Bangkok 10230

Tel: 02-9435814-5 Fax: 02-9438201 Tax id: 0105555170865

REPORT QA. GAS-CALIBRATOR

CALIBRATE DATE: 10 Jan 23

GAS CALIBRATOR

MANUFACTURER: Envirotronics MODEL: 6100 S/N: 7462

FLOW CALIBRATOR: DryCal® DC-Lite MODEL: DCL-H S/N: 107934

MODEL: DCLT 5K S/N: 2105

MANUFACTURER: Bios International Corporation

REPORT QA. GAS-CALIBRATOR

AIR	SETTING	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	AVG
FLOW	REF	996.00	2003.00	3004.00	3995.00	5001.00	5994.00	6991.00	7995.00	9005.00	9870.00	
(CCM)	%ERROR	-0.400	0.150	0.133	-0.125	0.020	-0.100	-0.129	-0.063	0.026	-1.300	-0.18
GAS	SETTING	10	20	30	40	50	60	70	80	90	100	AVG
FLOW	REF	10.11	20.14	30.02	40.08	50.24	60.02	70.11	80.21	90.23	100.02	
(CCM)	%ERROR	1.100	0.700	0.067	0.200	0.480	0.033	0.157	0.262	0.256	0.020	0.33

Standard Reference

Reference Photometer Zero Air Brand: API Analyzer Model 701 S/N 349

Calibration Test Results

Expected Ozone (PPM)	REF Photometer Reading before adjust	REF Photometer Reading after adjust	% Error	Status
0.000	0.131	0.000	0.000	pass
0.100	0.088	0.100	0.000	pass
0.200	0.176	0.199	-0.503	pass
0.300	0.286	0.298	-0.671	pass
0.400	0.388	0.396	-1.010	pass

TEMPERATURE: 26.5 DEG.C

PRESSURE: 752 mmHg

TESTED BY:

Mr. Pasagom Samol



ENVIR SERVICE
42 Raminthe 14 year 9, Tha Raeng, Bangkok, Bangkok 10230
Tel : 02-9435814-5 Fax : 02-9438201 Tax ID : 0105555170865

Standard Reference

Reference Photometer Zero Air
Brand : API Analyzer Model 701 S/N 949

Calibration Test Results

Expected Ozone (PPM)	REF Photometer Reading before adjust	REF Photometer Reading after adjust	% Error	Status
0.000	0.020	0.000	0.000	pass
0.100	0.088	0.100	0.000	pass
0.200	0.176	0.199	-0.500	pass
0.300	0.266	0.298	-0.667	pass
0.400	0.358	0.395	-1.000	pass

TEMPERATURE : 26.5 DEG.C
PRESSURE : 752 mmHg



TESTED BY : Mr. Patagon Samol



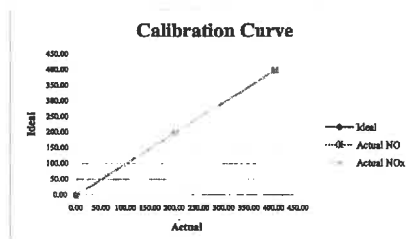
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WATER ANALYSIS CENTER COMPANY LIMITED
194 หมู่ 5 ต.หนองปรือ อ.บางละมุง จ.ชลบุรี 13210
Tel : 0-35226-381, 0-35800-593 Fax : 0-35800-594

Nitrogen Dioxide Analyzer Calibration Worksheet

Project Site : งานอุตสาหกรรมโรงงาน อู่ทอง
Location : บ้านนาหวาย
Date of measurement : 20 April 2023
Worksheet No. : C-200423-WWL 0114
Ambient NO_x Analyzer ID : WWL 0114
Manufacturer : HORIBA
Ambient NO_x Analyzer Model : APNA-370
Ambient NO_x Analyzer S/N : PLE99953

Multi Gas Calibrator
Calibrator ID : WWL0128
Calibrator Model : Series 6100
Calibrator S/N : S/N 7462
Calibrate Date : 10 January 2023
Cylinder Std. Gas
Std. Gas Concentration (PPM) : 50.90
Cylinder Pressure (psi) : 2000
Certified Date : 07 December 2021
Expired Date : 07 December 2025
Serial No. : CC241587

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NO _x	Error NO _x	%Error NO _x
ZERO	0.00	0.20	0.20	-	0.20	0.20	-
SPAN 200 ppb	200.00	200.10	0.10	0.05	200.30	0.20	0.10
SPAN 400 ppb	400.00	400.10	0.10	0.03	400.20	0.20	0.05
AVERAGE (%)				0.04			0.07



Calibrated by : S.H.
(Mr. SUTWAT JAITHERAPAKUL)
Chemist

Approved by : R.
(Mr. RINGSASIKORN KOSUM)
Technical Manager



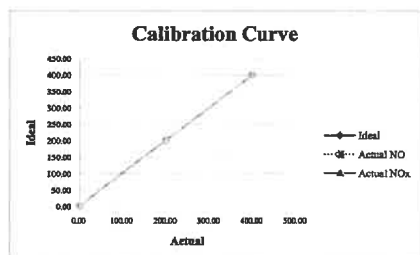
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WATER ANALYSIS CENTER COMPANY LIMITED
194 หมู่ 5 ต.หนองปรือ อ.บางละมุง จ.ชลบุรี 13210
Tel : 0-35226-381, 0-35800-593 Fax : 0-35800-594

Nitrogen Dioxide Analyzer Calibration Worksheet

Project Site : งานอุตสาหกรรมโรงงาน อู่ทอง
Location : บ้านนาหวาย
Date of measurement : 20 April 2023
Worksheet No. : C-200423-WWL 0116
Ambient NO_x Analyzer ID : WWL 0116
Manufacturer : HORIBA
Ambient NO_x Analyzer Model : APNA-370
Ambient NO_x Analyzer S/N : 9BRJGTUK

Multi Gas Calibrator
Calibrator ID : WWL0128
Calibrator Model : Series 6100
Calibrator S/N : S/N 7462
Calibrate Date : 10 January 2023
Cylinder Std. Gas
Std. Gas Concentration (PPM) : 50.90
Cylinder Pressure (psi) : 2000
Certified Date : 07 December 2021
Expired Date : 07 December 2025
Serial No. : CC241587

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NO _x	Error NO _x	%Error NO _x
ZERO	0.00	0.20	0.20	-	0.20	0.20	-
SPAN 200 ppb	200.00	200.20	0.20	0.10	200.30	0.30	0.15
SPAN 400 ppb	400.00	400.30	0.30	0.08	400.20	0.20	0.05
AVERAGE (%)				0.09			0.10



Calibrated by : S.H.
(Mr. SUTWAT JAITHERAPAKUL)
Chemist

Approved by : R.
(Mr. RINGSASIKORN KOSUM)
Technical Manager



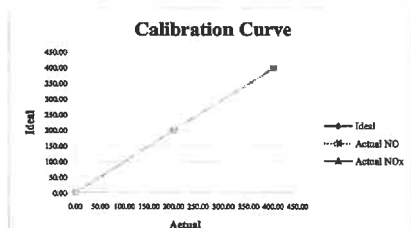
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WATER ANALYSIS CENTER COMPANY LIMITED
194 หมู่ 5 ต.หนองปรือ อ.บางละมุง จ.ชลบุรี 13210
Tel : 0-35226-381, 0-35800-593 Fax : 0-35800-594

Nitrogen Dioxide Analyzer Calibration Worksheet

Project Site : งานอุตสาหกรรมโรงงาน อู่ทอง
Location : บ้านนาหวาย
Date of measurement : 20 April 2023
Worksheet No. : C-200423-WWL 0115
Ambient NO_x Analyzer ID : WWL 0115
Manufacturer : HORIBA
Ambient NO_x Analyzer Model : APNA-370
Ambient NO_x Analyzer S/N : 705KASU

Multi Gas Calibrator
Calibrator ID : WWL0128
Calibrator Model : Series 6100
Calibrator S/N : S/N 7462
Calibrate Date : 10 January 2023
Cylinder Std. Gas
Std. Gas Concentration (PPM) : 50.90
Cylinder Pressure (psi) : 2000
Certified Date : 07 December 2021
Expired Date : 07 December 2025
Serial No. : CC241587

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NO _x	Error NO _x	%Error NO _x
ZERO	0.00	0.20	0.20	-	0.20	0.20	-
SPAN 200 ppb	200.00	200.10	0.10	0.05	200.30	0.20	0.10
SPAN 400 ppb	400.00	400.10	0.10	0.03	400.20	0.20	0.05
AVERAGE (%)				0.04			0.07



Calibrated by : S.H.
(Mr. SUTWAT JAITHERAPAKUL)
Chemist

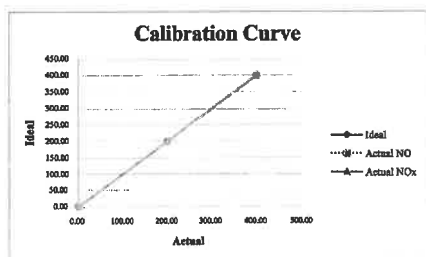
Approved by : R.
(Mr. RINGSASIKORN KOSUM)
Technical Manager

Nitrogen Dioxide Analyzer Calibration Worksheet

Project Site : สวนอุตสาหกรรมโรจนะ อุตสาหกรรม
Location : อำเภอเมืองสุพรรณบุรี
Date of measurement : 20 April 2023
Worksheet No. : C-200423-WVL 0117
Ambient NOx Analyzer ID : WVL 0117
Manufacturer : HORIBA
Ambient NOx Analyzer Model : APNA-370
Ambient NOx Analyzer S/N : VKLYC3K0

Multi Gas Calibrator
Calibrator ID : WVL0128
Calibrator Model : Series 6100
Calibrator S/N : S/N 7462
Calibrate Date : 28 February 2019
Cylinder Std. Gas
Std. Gas Concentration (PPM) : 50.90
Cylinder Pressure (psi) : 2000
Certified Date : 07 December 2017
Expired Date : 07 December 2021
Serial No. : CC241587

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NO _x	Error NO _x	%Error NO _x
ZERO	0.00	0.20	0.20	-	0.20	0.20	-
SPAN 200 ppb	200.00	200.10	0.10	0.05	200.30	0.30	0.15
SPAN 400 ppb	400.00	400.20	0.20	0.05	400.20	0.20	0.05
AVERAGE (%)				0.05			0.10



Calibrated by : Sutthi
(Mr. SUTTIWAT JAITHEERAPAKKUL)
Client

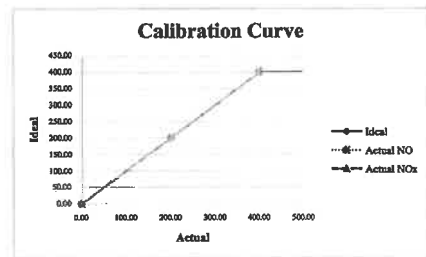
Approved by : [Signature]
(Mr. RUNGSASIKORN KOSUM)
Technical Manager

Nitrogen Dioxide Analyzer Calibration Worksheet

Project Site : สวนอุตสาหกรรมโรจนะ อุตสาหกรรม
Location : อำเภอเมืองสุพรรณบุรี
Date of measurement : 20 April 2023
Worksheet No. : C-200423-WVL 0113
Ambient NOx Analyzer ID : WVL 0113
Manufacturer : HORIBA
Ambient NOx Analyzer Model : APNA-370
Ambient NOx Analyzer S/N : WDMY8HT8

Multi Gas Calibrator
Calibrator ID : WVL0128
Calibrator Model : Series 6100
Calibrator S/N : S/N 7462
Calibrate Date : 10 January 2023
Cylinder Std. Gas
Std. Gas Concentration (PPM) : 50.90
Cylinder Pressure (psi) : 2000
Certified Date : 07 December 2017
Expired Date : 07 December 2021
Serial No. : CC241587

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NO _x	Error NO _x	%Error NO _x
ZERO	0.00	0.20	0.20	-	0.20	0.20	-
SPAN 200 ppb	200.00	200.20	0.20	0.10	200.30	0.30	0.15
SPAN 400 ppb	400.00	400.10	0.10	0.03	400.20	0.20	0.05
AVERAGE (%)				0.06			0.10



Calibrated by : Sutthi
(Mr. SUTTIWAT JAITHEERAPAKKUL)
Client

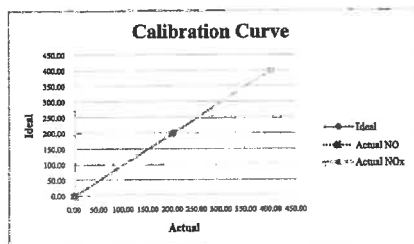
Approved by : [Signature]
(Mr. RUNGSASIKORN KOSUM)
Technical Manager

Nitrogen Dioxide Analyzer Calibration Worksheet

Project Site : สวนอุตสาหกรรมโรจนะ อุตสาหกรรม
Location : อำเภอเมืองสุพรรณบุรี
Date of measurement : 20 April 2023
Worksheet No. : C-200423-WVL 0114
Ambient NOx Analyzer ID : -
Manufacturer : Thermo
Ambient NOx Analyzer Model : 42C
Ambient NOx Analyzer S/N : 1209-074

Multi Gas Calibrator
Calibrator ID : WVL0128
Calibrator Model : Series 6100
Calibrator S/N : S/N 7462
Calibrate Date : 10 January 2023
Cylinder Std. Gas
Std. Gas Concentration (PPM) : 50.90
Cylinder Pressure (psi) : 2000
Certified Date : 07 December 2021
Expired Date : 07 December 2022
Serial No. : CC241587

Point	CALIBRATION RESULTS						
	Ideal	Actual NO	Error NO	%Error NO	Actual NO _x	Error NO _x	%Error NO _x
ZERO	0.00	0.20	0.20	-	0.20	0.20	-
SPAN 200 ppb	200.00	200.20	0.20	0.10	200.20	0.20	0.10
SPAN 400 ppb	400.00	400.30	0.30	0.08	400.20	0.20	0.05
AVERAGE (%)				0.09			0.07



Calibrated by : Sutthi
(Mr. SUTTIWAT JAITHEERAPAKKUL)
Client

Approved by : [Signature]
(Mr. RUNGSASIKORN KOSUM)
Technical Manager

NOx Analyzer Verification Test Report

Calibration Report No.: AP-N8504001

Page: 1/1

Calibrated Date: 1-Apr-23

Location : บ้านดอนใหญ่

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NONO2/NOx Analyzer Model: T200	Manufacturer API S/N: ENOA/T20002470
--	---

Calibration System

Calibrator Unit	Standard Gas
Dilutor Model: ESA MGC101 S/N: 782 ZERO AIR Generator ZAG7001 S/N: 844	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EBO140762

Environment: Temperature 28.5 °C

Humidity: 60 %RH

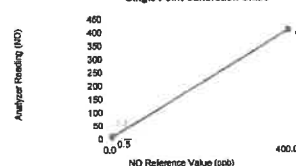
Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	3.2	0.0	3.2	388.5	400.0	-1.3
NO ₂	2.1	0.0	2.1	17.5	0.0	2.2
NOx	5.3	0.0	5.3	407.0	400.0	0.9

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.2	0.0	0.2	401.0	400.0	0.1
NO ₂	0.3	0.0	0.3	3.0	0.0	0.4
NOx	0.5	0.0	0.5	404.0	400.0	0.5

Single Point Calibration Chart



approval of Neediss : [Signature]

NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6604001

Calibrated Date: 1-Apr-23

Location : บ้านนาเกลือ

Page:1/1

☒ PM ☐ Onsite

Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Apr-23				
Time	10:10				
Range	0.00 - 500.00 PPB	PPB	500	500	
Stability (Zero Gas)	± 0.2	PPB	0.5	0.2	
Sample Flow	200±10	col/min	511	532	
Ozone Flow	50-80	col/min	80	80	
PMT Detector	0-5000	mV	27.4	18.4	
AZERO	±0.150	mV	54.2	54.2	
HVPS	400-800 constant	V	819	819	
DCPS	2500 ± 200	mV	-	-	
CELL TEMP	30±1	Dragage C	50	50	
BOX TEMP	20-35	Dragage C	33.7	32.8	
PMT TEMP	7 ±1	Dragage C	7.1	7.1	
ISB TEMP	50±4	Dragage C	-	-	
MOLY Temp	115 ±1.5	Dragage C	314.4	315.0	
CELL PRES	±10 constant	IN-Hg-A	10	10	
SAHP PRES	20-30 constant	IN-Hg-A	29.9	29.4	
NO Slope	1 ± 0.3		0.820	0.801	
NO Slope	1 ± 0.3		0.848	0.813	
NO Offset	10 to + 150	mV	10.2	15.3	
NO Offset	10 to + 150	mV	-2.0	-3.4	
Span and Cal Values					
Zero Value	NO	0	ppb	3.2	0.2
Zero Value	NOx	0	ppb	5.3	0.5
Span Value	NO	400	ppb	388.5	401.0
Span Value	NOx	400	ppb	407.0	404.0

Calibrate By: Sirrat Poonlak

Date: 1-Apr-23

Approve By: Serwut Kaewarinal

Date: 1-Apr-23

neediss
Neediss Supply Instrument Co., Ltd.

NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6604002

Calibrated Date: 1-Apr-23

Location : บ้านนาเกลือ

Page:1/1

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer
Model: T200

Manufacturer API
S/N: ENOAIT20002467

Calibration System

Calibrator Unit

Dilutor Model ESA MGC101

S/N: 782

ZERO AIR Generator ZAG7001

S/N: 844

Standard Gas

NO Conc 44.68 PPM

SO2 Conc 45.34 PPM

CO Conc 4500 PPM

Expire Date: Feb 19, 2024

EB0140762

Environment: Temperature 28.5 °C

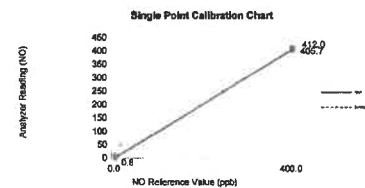
Humidity: 50 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	4.0	0.0	4.0	410.5	400.0	1.3
NO2	2.1	0.0	2.1	1.5	0.0	0.2
NOx	6.1	0.0	6.1	412.0	400.0	1.5

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.3	0.0	0.3	403.0	400.0	0.4
NO2	0.5	0.0	0.5	2.7	0.0	0.3
NOx	0.8	0.0	0.8	405.7	400.0	0.7



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6604002

Calibrated Date: 1-Apr-23

Location : บ้านนาเกลือ

Page:1/1

☒ PM ☐ Onsite

Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Apr-23				
Time	10:20				
Range	0.00 - 500.00 PPB	PPB	500.0	500.0	
Stability (Zero Gas)	± 0.2	PPB	0.5	0.3	
Sample Flow	200±10	col/min	474.0	441.0	
Ozone Flow	50-80	col/min	78.0	76.0	
PMT Detector	0-5000	mV	24.5	62.2	
AZERO	±0.150	mV	8.8	87.5	
HVPS	400-800 constant	V	839.0	836.0	
DCPS	2500 ± 200	mV	-	-	
CELL TEMP	30±1	Dragage C	50.0	50.0	
BOX TEMP	20-35	Dragage C	34.5	30.5	
PMT TEMP	7 ±1	Dragage C	7.0	7.1	
ISB TEMP	50±4	Dragage C	-	-	
MOLY Temp	115 ±1.5	Dragage C	315.0	314.4	
CELL PRES	±10 constant	IN-Hg-A	4.20	7.90	
SAHP PRES	20-30 constant	IN-Hg-A	29.9	28.0	
NO Slope	1 ± 0.3		1.256	1.032	
NO Slope	1 ± 0.3		1.232	1.048	
NO Offset	10 to + 150	mV	4.50	6.90	
NO Offset	10 to + 150	mV	-5.00	-1.50	
Span and Cal Values					
Zero Value	NO	0	ppb	4.0	0.3
Zero Value	NOx	0	ppb	6.1	0.8
Span Value	NO	400	ppb	410.5	403.0
Span Value	NOx	400	ppb	412.0	405.7

Calibrate By: Sirrat Poonlak

Date: 1-Apr-23

Approve By: Serwut Kaewarinal

Date: 1-Apr-23

neediss
Neediss Supply Instrument Co., Ltd.

NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6604003

Calibrated Date: 1-Apr-23

Location : บ้านนาเกลือ

Page:1/1

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer
Model: T200

Manufacturer API
S/N: ENOAIT20002468

Calibration System

Calibrator Unit

Dilutor Model ESA MGC101

S/N: 782

ZERO AIR Generator ZAG7001

S/N: 844

Standard Gas

NO Conc 44.68 PPM

SO2 Conc 45.34 PPM

CO Conc 4500 PPM

Expire Date: Feb 19, 2024

EB0140762

Environment: Temperature 28.5 °C

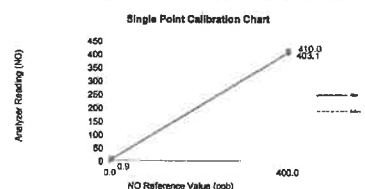
Humidity: 50 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	3.1	0.0	3.1	408.0	400.0	1.0
NO2	0.4	0.0	0.4	2.0	0.0	0.2
NOx	3.5	0.0	3.5	410.0	400.0	1.2

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.5	0.0	0.5	401.2	400.0	0.1
NO2	0.4	0.0	0.4	1.9	0.0	0.2
NOx	0.9	0.0	0.9	403.1	400.0	0.4



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6604003

Page:1/1

Calibrated Date: 1-Apr-23

Location : บ้านนา

☒ PM ☐ Onsite

Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Apr-23				
Time	12:30:30 AM				
Range	0.00 - 500.00 PPM	PPM	500	500	
Stability (Zero Gas)	± 0.2	PPM	0.5	0.2	
Sample Flow	500±50	cc/min	505	480	
Ozone Flow	50-80	cc/min	78	72	
PMT Detector	0-5000	mV	28.2	28.3	
AZERO	±20-150	mV	56.0	55.0	
WVPS	400-900 constant	V	755	755	
DCPS	2500 ± 200	mV	-	-	
CELL TEMP	30±1	Dragee C	50	50	
BOX TEMP	20-35	Dragee C	30.2	32.0	
PMT TEMP	7 ± 1	Dragee C	7.2	7.2	
WV TEMP	50±4	Dragee C	-	-	
MOV Temp	315 ± 5	Dragee C	315.0	315.0	
ICEE PRES	±10 constant	IN-Hg-A	4	5	
SAMP PRES	20-30 constant	IN-Hg-A	29	29	
NO Slope	1 ± 0.3		0.880	1.118	
NO Offset	10 to ± 150	mV	12.9	2.2	
NOx Offset	10 to ± 150	mV	-2.4	8.1	
Span and Cal Values					
Zero Value	NO	0	ppb	3.1	0.5
Zero Value	NOx	0	ppb	3.5	0.9
Span Value	NO	400	ppb	408.0	401.2
Span Value	NOx	400	ppb	410.0	403.1

Calibrate By: Sirrat Poonlak
Date: 1-Apr-23

Approve By: Sarawut Kawerhuat
Date: 1-Apr-23

neediss
Neediss Supply Instrument Co., Ltd.

NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6604009

Page:1/1

Calibrated Date: 1-Apr-23

Location : บ้านนา

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NONOX2NOx Analyzer
Model: T200

Manufacturer API
S/N: ENOAIT20002468

Calibration System

Calibrator Unit

Dilutor Model ESA MGC101

S/N: 792

ZERO AIR Generator ZAG7001

S/N: 644

Standard Gas

NO Conc: 44.58 PPM

SO2 Conc: 45.34 PPM

CO Conc: 4500 PPM

Expire Date: Feb 18, 2024

EB0140762

Environment: Temperature 28.8 °C

Humidity 52 %RH

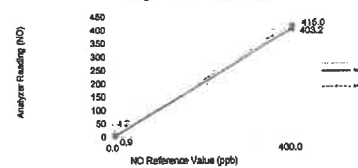
Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	3.5	0.0	3.5	412.0	400.0	1.3
NO ₂	0.7	0.0	0.7	3.0	0.0	0.4
NOx	4.2	0.0	4.2	415.0	400.0	1.8

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.5	0.0	0.5	411.8	400.0	0.3
NO ₂	0.4	0.0	0.4	1.8	0.0	0.2
NOx	0.9	0.0	0.9	403.2	400.0	0.4

Single Point Calibration Chart



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6604009

Page:1/1

Calibrated Date: 1-Apr-23

Location : บ้านนา

☒ PM ☐ Onsite

Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Apr-23				
Time	12:15				
Range	0.00 - 500.00 PPM	PPM	500	500	
Stability (Zero Gas)	± 0.2	PPM	0.4	0.2	
Sample Flow	500±50	cc/min	482	488	
Ozone Flow	50-80	cc/min	80	80	
PMT Detector	0-5000	mV	33.2	25.1	
AZERO	±20-150	mV	23.4	23.0	
WVPS	400-900 constant	V	733	733	
DCPS	2500 ± 200	mV	-	-	
CELL TEMP	30±1	Dragee C	48.9	50.0	
BOX TEMP	20-35	Dragee C	34.2	33.5	
PMT TEMP	7 ± 1	Dragee C	7.0	7.0	
WV TEMP	50±4	Dragee C	-	-	
MOV Temp	315 ± 5	Dragee C	314.9	314.9	
ICEE PRES	±10 constant	IN-Hg-A	4.5	4.5	
SAMP PRES	20-30 constant	IN-Hg-A	29.5	23.0	
NO Slope	1 ± 0.3		0.850	1.095	
NO Offset	10 to ± 150	mV	7.1	4.1	
NOx Offset	10 to ± 150	mV	-5.9	15.3	
Span and Cal Values					
Zero Value	NO	0	ppb	3.5	0.5
Zero Value	NOx	0	ppb	4.2	0.9
Span Value	NO	400	ppb	412.0	401.8
Span Value	NOx	400	ppb	415.0	403.2

Calibrate By: Sirrat Poonlak
Date: 1-Apr-23

Approve By: Sarawut Kawerhuat
Date: 1-Apr-23

neediss
Neediss Supply Instrument Co., Ltd.

Sulfur Dioxide Analyzer Calibration Worksheet

Project Site :

ตามจุดตรวจวัดในเขต อ.บางพลี

Location :

บ้านนา

Date of measurement :

20 April 2023

Worksheet No. :

C-200423W/L 0109

Ambient SO₂ Analyzer ID :

WWL0109

Manufacturer :

HORIBA

Ambient SO₂ Analyzer Model :

APSA-370

Ambient SO₂ Analyzer S/N :

YDL839W0

Multi Gas Calibrator

Calibrator ID : WWL0128

Calibrator Model : Series 6100

Calibrator S/N : S/N 7462

Calibrate Date : 10 January 2023

Cylinder Std. Gas

Std. Gas Concentration (PPM) : 50.90

Cylinder Pressure (psi) : 2800

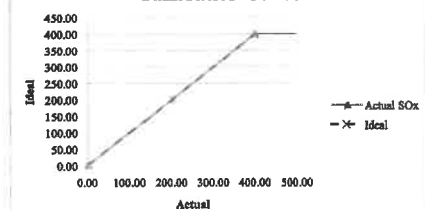
Certified Date : 07 December 2021

Expired Date : 07 December 2025

Serial No. : CC241587

Point	CALIBRATION RESULTS			
	Ideal	Actual SO ₂	Error Sox	%Error Sox
ZERO	0.00	0.00	0.00	-
SPAN 200 ppb	200.00	200.10	0.10	0.05
SPAN 400 ppb	400.00	400.10	0.10	0.03
AVERAGE (%)				0.04

Calibration Curve



Calibrated by: Sirrat Poonlak
(Mr. RUTIWAT JATTHEERAPAKUL)
Checker

Approved by: Sarawut Kawerhuat
(Mr. RUNGASIKORN KOSUM)
Technical Manager



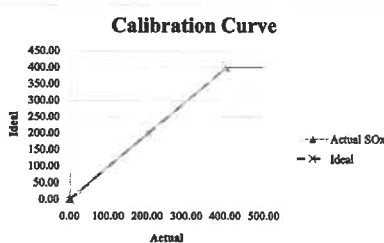
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WATER ANALYSIS CENTER COMPANY LIMITED
194 หมู่ 5 ต.หนองปรือ อ.บางละมุง จ.ชลบุรี 13210
194 Moo 5, T.Nongprue, A.Banglamung, Ayutthaya 13210, Thailand
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-594

Sulfur Dioxide Analyzer Calibration Worksheet

Project Site : งานอุตสาหกรรมโรงงาน อุตสาหกรรม
Location : จังหวัดชลบุรี
Date of measurement : 20 April 2023
Worksheet No. : C-300423-WWL 0110
Ambient SO_x Analyzer ID : WWL 0110
Manufacturer : HORIBA
Ambient SO_x Analyzer Model : APSA-370
Ambient SO_x Analyzer S/N : YSSW7T00

Multi Gas Calibrator
Calibrator ID : WWL0128
Calibrator Model : Series 6100
Calibrator S/N : S/N 7462
Calibrate Date : 28 February 2019
Cylinder Std. Gas
Std. Gas Concentration (PPM) : 49.68
Cylinder Pressure (psi) : 2000
Certified Date : 07 December 2017
Expired Date : 07 December 2021
Serial No. : CC241587

Point	CALIBRATION RESULTS			
	Ideal	Actual SO _x	Error Sox	%Error Sox
ZERO	0.00	0.00	0.00	-
SPAN 200 ppb	200.00	200.20	0.20	0.10
SPAN 400 ppb	400.00	400.20	0.20	0.05
AVERAGE (%)				0.07



Calibrated by: *Suttawat*
(Mr. SUTTIWAT JAITHEERAPAPKUL)
Chemist

Approved by: *Rungsasikorn*
(Mr. RUNGSASIKORN KOSUM)
Technical Management



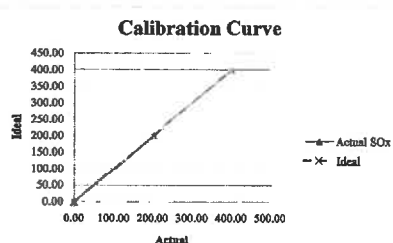
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194 Moo 5, T.Nongprue, A.Banglamung, Ayutthaya 13210, Thailand
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-594

Sulfur Dioxide Analyzer Calibration Worksheet

Project Site : งานอุตสาหกรรมโรงงาน อุตสาหกรรม
Location : จังหวัดชลบุรี
Date of measurement : 20 April 2023
Worksheet No. : C-300423-WWL 0111
Ambient SO_x Analyzer ID : WWL 0111
Manufacturer : HORIBA
Ambient SO_x Analyzer Model : APSA-370
Ambient SO_x Analyzer S/N : PORKTBDX

Multi Gas Calibrator
Calibrator ID : WWL0128
Calibrator Model : Series 6100
Calibrator S/N : S/N 7462
Calibrate Date : 10 January 2023
Cylinder Std. Gas
Std. Gas Concentration (PPM) : 50.90
Cylinder Pressure (psi) : 2000
Certified Date : 07 December 2021
Expired Date : 07 December 2025
Serial No. : CC241587

Point	CALIBRATION RESULTS			
	Ideal	Actual SO _x	Error Sox	%Error Sox
ZERO	0.00	0.00	0.00	-
SPAN 200 ppb	200.00	200.30	0.30	0.15
SPAN 400 ppb	400.00	400.20	0.20	0.05
AVERAGE (%)				0.10



Calibrated by: *Suttawat*
(Mr. SUTTIWAT JAITHEERAPAPKUL)
Chemist

Approved by: *Rungsasikorn*
(Mr. RUNGSASIKORN KOSUM)
Technical Management



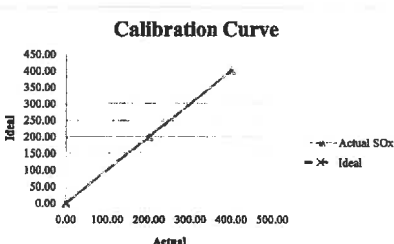
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WATER ANALYSIS CENTER COMPANY LIMITED
194 หมู่ 5 ต.หนองปรือ อ.บางละมุง จ.ชลบุรี 13210
194 Moo 5, T.Nongprue, A.Banglamung, Ayutthaya 13210, Thailand
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-594

Sulfur Dioxide Analyzer Calibration Worksheet

Project Site : งานอุตสาหกรรมโรงงาน อุตสาหกรรม
Location : จังหวัดชลบุรี
Date of measurement : 20 April 2023
Worksheet No. : C-300423-WWL 0112
Ambient SO_x Analyzer ID : WWL 0112
Manufacturer : HORIBA
Ambient SO_x Analyzer Model : APSA-370
Ambient SO_x Analyzer S/N : 8R1BJBBF

Multi Gas Calibrator
Calibrator ID : WWL0128
Calibrator Model : Series 6100
Calibrator S/N : S/N 7462
Calibrate Date : 28 February 2019
Cylinder Std. Gas
Std. Gas Concentration (PPM) : 49.68
Cylinder Pressure (psi) : 2000
Certified Date : 07 December 2017
Expired Date : 07 December 2021
Serial No. : CC241587

Point	CALIBRATION RESULTS			
	Ideal	Actual SO _x	Error Sox	%Error Sox
ZERO	0.00	0.00	0.00	-
SPAN 200 ppb	200.00	200.10	0.10	0.05
SPAN 400 ppb	400.00	400.10	0.10	0.03
AVERAGE (%)				0.04



Calibrated by: *Suttawat*
(Mr. SUTTIWAT JAITHEERAPAPKUL)
Chemist

Approved by: *Rungsasikorn*
(Mr. RUNGSASIKORN KOSUM)
Technical Management



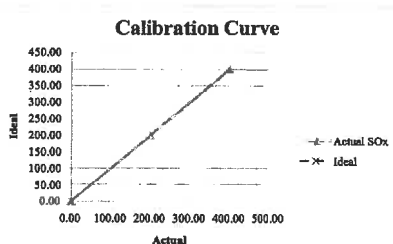
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194 Moo 5, T.Nongprue, A.Banglamung, Ayutthaya 13210, Thailand
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-594

Sulfur Dioxide Analyzer Calibration Worksheet

Project Site : งานอุตสาหกรรมโรงงาน อุตสาหกรรม
Location : จังหวัดชลบุรี
Date of measurement : 20 April 2023
Worksheet No. : C-300423-WWL 0118
Ambient SO_x Analyzer ID : WWL 0118
Manufacturer : HORIBA
Ambient SO_x Analyzer Model : APSA-370
Ambient SO_x Analyzer S/N : W2VNUX08

Multi Gas Calibrator
Calibrator ID : WWL0128
Calibrator Model : Series 6100
Calibrator S/N : S/N 7462
Calibrate Date : 10 January 2023
Cylinder Std. Gas
Std. Gas Concentration (PPM) : 50.90
Cylinder Pressure (psi) : 2000
Certified Date : 07 December 2021
Expired Date : 07 December 2025
Serial No. : CC241587

Point	CALIBRATION RESULTS			
	Ideal	Actual SO _x	Error Sox	%Error Sox
ZERO	0.00	0.00	0.00	-
SPAN 200 ppb	200.00	200.10	0.10	0.05
SPAN 400 ppb	400.00	400.20	0.20	0.05
AVERAGE (%)				0.05



Calibrated by: *Suttawat*
(Mr. SUTTIWAT JAITHEERAPAPKUL)
Chemist

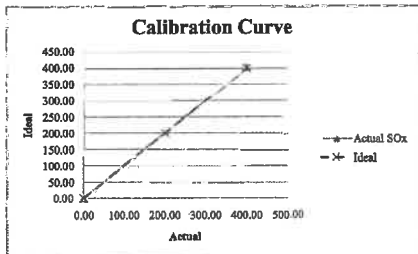
Approved by: *Rungsasikorn*
(Mr. RUNGSASIKORN KOSUM)
Technical Management

Sulfur Dioxide Analyzer Calibration Worksheet

Project Site : บ้านสุขุมวิท 111
Location : บ้านสุขุมวิท 111
Date of measurement : 20 April 2023
Worksheet No. : C-200423WVL 0109
Ambient SO₂ Analyzer ID :
Manufacturer : Thermo
Ambient SO₂ Analyzer Model : 43C
Ambient SO₂ Analyzer S/N : 1209-075

Mult Gas Calibrator
Calibrator ID : WWL0128
Calibrator Model : Series 6100
Calibrator S/N : S/N 7462
Calibrate Date : 10 January 2023
Cylinder Std. Gas
Std. Gas Concentration (PPM) : 50.99
Cylinder Pressure (psi) : 2000
Certified Date : 07 December 2021
Expired Date : 07 December 2025
Serial No. : CC241587

Point	CALIBRATION RESULTS			
	Ideal	Actual SO ₂	Error Sox	%Error Sox
ZERO	0.00	0.00	0.00	-
SPAN 200 ppb	200.00	200.30	0.30	0.15
SPAN 400 ppb	400.00	400.20	0.20	0.05
AVERAGE (%)				0.10



Calibrate by : Sutit
(Mr. SUTIWAT JANTHERRAFAPUL)
Checker

Approved by : B
(Mr. RUNGSAKORN KOSUM)
Technical Manager

SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6804008

Calibrated Date: 1-Apr-23

Location : บ้านสุขุมวิท

☒ PM ☐ Onsite

Page: 2/2

Test Function Value	Normal range	Unit	Before	After	Note
Date	1-Apr-23				
Time	13:10				
Range	50 - 2000	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.8	0.2	
Sample Flow	600 (+/- 50)	cc/min	603	609	
PMT Detector	0 - 6000	mV	36.5	34.5	
Norm PMT Detector	0 - 6000	mV	34.1	32.8	
HVPS	400-800 constant	V	719	648	
OCPS	2500 (+/- 200)	mV	-	-	
CELL TEMP	50 (+/- 1)	Dragee C	80	80	
BOX TEMP	20-40	Dragee C	34.1	32.7	
PMT TEMP	7 (+/- 1)	Dragee C	8.0	8.0	
UV lamp	1000-4900	mV	4034.0	4034.0	
Lamp Ratio	30-120	%	114.0	114.0	
STR. Light (Zero Gas)	< 100	PPB	29	29	
Dark PMT	< 50 (-/+200)	mV	44.7	44.7	
Dark lamp	< 50 (-/+200)	mV	5.1	5.1	
SAFETY PRESS	20-30 constant	mmHg-A	28.1	27.8	
Electric Test/Cycle Test					
PMT Volt	2000 (+/- 500)	mV	2004	2020	
SO ₂ Conc	1000 (+/- 250)	PPB	1002	1010	
SO ₂ Slope	1 (+/- 0.3)	-	0.920	0.886	
SO ₂ Offset	< 250	mV	66	130.1	
Stability at Zero	< 0.2	PPB	0.1	0.1	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.6	0.2	
Gas Test Response					
Zero Gas (0.00 PPB)	0	ppb	1.2	0.4	
Span Gas (400 PPB)	400	ppb	397.2	401.5	± 0.6% of Range

Calibrate By : Sutit
Sutit Poonlark
Date: 1-Apr-23

Approve By : B
Sarawut Keenwornul
Date: 1-Apr-23

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Neediss Supply Instrument Co., Ltd.

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SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6804008

Calibrated Date: 1-Apr-23

Location : บ้านสุขุมวิท

☒ PM ☐ Onsite

Instruments Information

Page: 1/2

Analyzer Type: SO2 Analyzer Model: T100	Manufacturer API S/N: ESOAIT10002033
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Calibration System

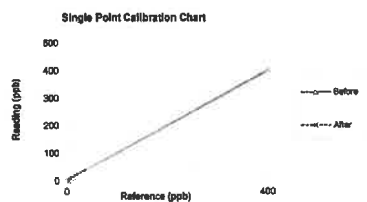
Calibrator Unit	Standard Gas
Dilutor Model: ESA MGC-101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO ₂ Conc 46.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140782

Environment: Temperature 26.7 °C

Humidity: 52 %RH

Calibration Report

Status	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	1.2	1.2	400.0	397.2	-0.4
After	0.0	0.4	0.4	400.0	401.5	0.2



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SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6804001

Calibrated Date: 1-Apr-23

Location : บ้านสุขุมวิท

☒ PM ☐ Onsite

Page: 2/2

Test Function Value	Normal range	Unit	Before	After	Note
Date	1-Apr-23				
Time	13:10				
Range	50 - 2000	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.8	0.2	
Sample Flow	600 (+/- 50)	cc/min	603	609	
PMT Detector	0 - 6000	mV	36.5	34.5	
Norm PMT Detector	0 - 6000	mV	34.1	32.8	
HVPS	400-800 constant	V	719	648	
OCPS	2500 (+/- 200)	mV	-	-	
CELL TEMP	50 (+/- 1)	Dragee C	80	80	
BOX TEMP	20-40	Dragee C	34.1	32.7	
PMT TEMP	7 (+/- 1)	Dragee C	8.0	8.0	
UV lamp	1000-4900	mV	4034.0	4034.0	
Lamp Ratio	30-120	%	114.0	114.0	
STR. Light (Zero Gas)	< 100	PPB	29	29	
Dark PMT	< 50 (-/+200)	mV	44.7	44.7	
Dark lamp	< 50 (-/+200)	mV	5.1	5.1	
SAFETY PRESS	20-30 constant	mmHg-A	28.1	27.8	
Electric Test/Cycle Test					
PMT Volt	2000 (+/- 500)	mV	2004	2020	
SO ₂ Conc	1000 (+/- 250)	PPB	1002	1010	
SO ₂ Slope	1 (+/- 0.3)	-	0.920	0.886	
SO ₂ Offset	< 250	mV	66	130.1	
Stability at Zero	< 0.2	PPB	0.1	0.1	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.6	0.2	
Gas Test Response					
Zero Gas (0.00 PPB)	0	ppb	1.2	0.4	
Span Gas (400 PPB)	400	ppb	397.2	401.5	± 0.6% of Range

Calibrate By : Sutit
Sutit Poonlark
Date: 1-Apr-23

Approve By : B
Sarawut Keenwornul
Date: 1-Apr-23

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SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6604001

Calibrated Date: 1-Apr-23

Location : บ้านนา

☒ PM ☐ Onsite

Instruments Information

Page: 1/2

Analyzer Type: SO2 Analyzer Model: T100	Manufacturer API S/N: ESOAIT10002032
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Calibration System

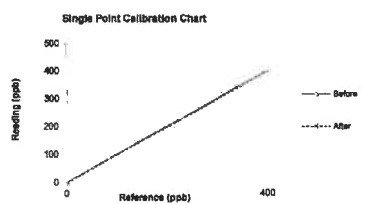
Calibrator Unit	Standard Gas
Dilutor Model: ESA WGC101 S/N: 702 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140782

Environment: Temperature 28.8 °C

Humidity: 50 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	2.5	2.5	400.0	407.7	1.0
After	0.0	0.8	0.8	400.0	402.1	0.3



SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6604009

Calibrated Date: 1-Apr-23

Location : บ้านนา

☒ PM ☐ Onsite

Page: 2/2

Test Function Value	Normal range	Unit	Before	After	Note
Date	1-Apr-23				
Time	11:50				
Range	50 - 20000	PPB	500	500	
Stability (Zero Gas)	± 0.2	PPB	0.5	0.2	
Sample Flow	850 (± 50)	cc/min	850	818	
PMT Detector	0 - 5000	mV	34.7	28.4	
Norm PMT Detector	0 - 5000	mV	44.8	25.9	
HVPS	400-800 constant	V	723	723	
DCPS	2500 (± 200)	mV	-	-	
CELL TEMP	30 (± 1)	Degrees C	50	50	
BOX TEMP	20-40	Degrees C	35.5	33.9	
PMT TEMP	7 (± 1)	Degrees C	8.0	8.0	
UV lamp	1000-4800	mV	2132.0	2132.0	
Lamp Ratio	30-120	%	114.0	114.0	
STR Light (Zero Gas)	± 100	PPB	19	19	
Dark PMT	-500 - (+200)	mV	84.5	84.5	
Dark lamp	-500 - (+200)	mV	-15.1	-15.1	
BAMP PRES	20-30 constant	PSI-Hg-A	27.4	27.8	
Electric Test/Optic Test					
PMT Volta	2500 (± 500)	mV	2012	2008	
SO2 Conc	1000 (± 250)	PPB	1006	1004	
SO2 Slope	1 (± 0.3)	-	0.959	0.959	
SO2 Offset	± 250	mV	30.3	1	
Stability at Zero	± 0.2	PPB	0.1	0.2	
Stability at Span	± 2 ppb @ 400 ppb	PPB	0.6	0.2	
Gas Test Response					
Zero Gas (0.00 PPB)	0	ppb	2.8	0.7	
Span Gas (400 PPB)	400	ppb	403.0	401.0	± 5% of Range

Calibrate By: Sirat Poonlek

Approve By: Sarawut Keawwattana

Date: 1-Apr-23

Date: 1-Apr-23

SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6604009

Calibrated Date: 1-Apr-23

Location : บ้านนา

☒ PM ☐ Onsite

Instruments Information

Page: 1/2

Analyzer Type: SO2 Analyzer Model: T100	Manufacturer API S/N: ESOAIT10002034
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Calibration System

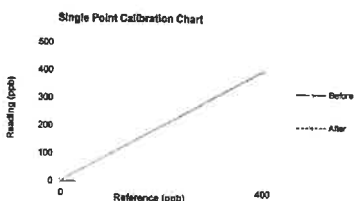
Calibrator Unit	Standard Gas
Dilutor Model: ESA WGC101 S/N: 702 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140782

Environment: Temperature 28.5 °C

Humidity: 62 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	2.6	2.6	400.0	403.0	0.4
After	0.0	0.7	0.7	400.0	401.0	0.1



SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6604010

Calibrated Date: 1-Apr-23

Location : บ้านนา

☒ PM ☐ Onsite

Page: 2/2

Test Function Value	Normal range	Unit	Before	After	Note
Date	1-Apr-23				
Time	18:40				
Range	50 - 20000	PPB	500	500	
Stability (Zero Gas)	± 0.2	PPB	0.5	0.3	
Sample Flow	850 (± 50)	cc/min	806	850	
PMT Detector	0 - 5000	mV	27.4	32.5	
Norm PMT Detector	0 - 5000	mV	30.4	41.7	
HVPS	400-800 constant	V	874	879	
DCPS	2500 (± 200)	mV	-	-	
CELL TEMP	30 (± 1)	Degrees C	50	50	
BOX TEMP	20-40	Degrees C	33.8	32.8	
PMT TEMP	7 (± 1)	Degrees C	7.9	7.9	
UV lamp	1000-4800	mV	3020	3022	
Lamp Ratio	30-120	%	96.5	96.5	
STR Light (Zero Gas)	± 100	PPB	20.2	20.0	
Dark PMT	-500 - (+200)	mV	184.5	184.5	
Dark lamp	-500 - (+200)	mV	3.4	3.4	
BAMP PRES	20-30 constant	PSI-Hg-A	28.0	27.4	
Electric Test/Optic Test					
PMT Volta	2500 (± 500)	mV	2014.0	2024.0	
SO2 Conc	1000 (± 250)	PPB	1007.0	1010.0	
SO2 Slope	1 (± 0.3)	-	1.000	1.011	
SO2 Offset	± 250	mV	44.3	38.5	
Stability at Zero	± 0.2	PPB	0.1	0.1	
Stability at Span	± 2 ppb @ 400 ppb	PPB	0.6	0.3	
Gas Test Response					
Zero Gas (0.00 PPB)	0	ppb	2.0	0.9	
Span Gas (400 PPB)	400	ppb	407.0	402.4	± 5% of Range

Calibrate By: Sirat Poonlek

Approve By: Sarawut Keawwattana

Date: 1-Apr-23

Date: 1-Apr-23



SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S8804010

Calibrated Date: 1-Apr-23

Location: บ้านนาสีนวล

☒ PM ☐ Onsite

Instruments Information

Page: 1/2

Analyzer Type: SO2 Analyzer Model: T100	Manufacturer API S/N: ESOAIT10002035
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Calibration System

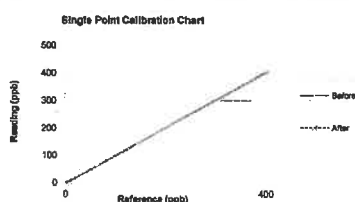
Calibrator Unit	Standard Gas
Dilutor Model ESA MG101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 844	NO Conc 44.69 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 27.6 °C

Humidity: 80 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	2.0	2.0	400.0	407.0	0.9
After	0.0	0.9	0.9	400.0	402.4	0.3



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0506 MTC No. REL. BP. 58/0565

CALIBRATION CERTIFICATE

Submitted by : WATER ANALYSIS CENTER CO., LTD.
Address : 1/94 Moo 5, T.Kanhan, A.U.-Thai, Ayutthaya 13120.
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 : Ambient Environment
Description : Sound Calibrator Temperature : (23 ± 3) °C
Manufacturer : BSWA TECH Relative Humidity : (50 ± 15) %
Model : CA111 Ambient Pressure : (101.325 ± 1.500) kPa
Serial No. : 520272
Standards used : 1. Digital Function Synthesizer NF Electronic DP-193A S/N 120037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tenaga TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005360.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Keikley 2015-P S/N 4106495.
7. Condenser Microphone Bruel&Kjaer 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 : 20 May 2022
Date of Calibration : 24 May 2022
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.

Head Office: 55 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang, Changwat Pathumthani 12120, Thailand
Tel: (66) 0 2577 9000
Fax: (66) 0 2577 9009
E-mail: numpat@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 2525 1872-80 ext. 115, 116
Fax: (66) 0 2525 9169
E-mail: mtg@tistr.or.th

Office: 196 Phahonyothin Road, Chatuchak, Bangkok 10900, Thailand
Tel: (66) 0 2579 1123-30 ext. 5219, 5225, 5217
Fax: (66) 0 2579 6592
E-mail: sarnalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0506 MTC No. REL. BP. 58/0565

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	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit
1/2 inch Bruel&Kjaer 4180	113.84	-0.16	± 0.10	IEC60942:2003 Class 1 ± 0.40 dB

2. Frequency

Standard Microphone	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit
1/2 inch Bruel&Kjaer 4180	1001.1	1.1	± 1.5	IEC60942:2003 Class 1 ± 1.0 %

3. Total Distortion

Standard Microphone	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit
1/2 inch Bruel&Kjaer 4180	0.62	± 0.50	IEC60942:2003 Class 1 ± 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. Nuttapon Niljiravuth)
Approved by : (Mr. Yawikiat Jansamman)
Date of Calibration : 24 May 2022
Date of Issue : 24 May 2022
Ref : 2011265052002210001
End of Certificate
3 / 3

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Head Office: 55 Mu 3 Tambon Khlong Ha, Amphoe Khlong Luang, Changwat Pathumthani 12120, Thailand
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Fax: (66) 0 2577 9009
E-mail: numpat@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 2525 1872-80 ext. 115, 116
Fax: (66) 0 2525 9169
E-mail: mtg@tistr.or.th

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Tel: (66) 0 2579 1123-30 ext. 5219, 5225, 5217
Fax: (66) 0 2579 6592
E-mail: sarnalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0506 MTC No. REL. BP. 58/0565

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	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit
1/2 inch Bruel&Kjaer 4180	93.77	-0.23	± 0.10	IEC60942:2003 Class 1 ± 0.40 dB

2. Frequency

Standard Microphone	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit
1/2 inch Bruel&Kjaer 4180	1001.0	1.0	± 1.5	IEC60942:2003 Class 1 ± 1.0 %

3. Total Distortion

Standard Microphone	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit
1/2 inch Bruel&Kjaer 4180	1.98	± 0.50	IEC60942:2003 Class 1 ± 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 : 24 May 2022
2 / 3

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Tel: (66) 0 2577 9000
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Office/Laboratory: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road, Amphoe Muang, Changwat Samutprakan 10280, Thailand
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Office: 196 Phahonyothin Road, Chatuchak, Bangkok 10900, Thailand
Tel: (66) 0 2579 1123-30 ext. 5219, 5225, 5217
Fax: (66) 0 2579 6592
E-mail: sarnalee@tistr.or.th

W	PO.LAB 6.4-1 /28	แก้ไขครั้งที่ : 0	วันที่บังคับใช้ : 1 มี.ค. 2562	หน้า : 1 ของ 1
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แบบบันทึกการทวนสอบเครื่อง Sound Level Meter

เครื่อง CA111 Sound Calibrator S/N 520272 รหัสเครื่อง 88004 เกณฑ์การยอมรับ 93.77 ± 0.3, 113.84 ± 0.3	วันที่สอบเทียบ 24/05/65	วันที่สอบเทียบครั้งต่อไป 23/05/66
เครื่อง Digital Thermohygrometer S/N 105091609	รหัสเครื่องมือ WWL 0055	วันที่สอบเทียบครั้งต่อไป 29/11/66
เครื่อง Sound Level Meter S/N 200051	รหัสเครื่องมือ WWL 0206	วันที่สอบเทียบครั้งต่อไป 14/11/67
วันที่สอบเทียบ 15-18/11/65		

การทวนสอบก่อนออกจำหน่าย

อุณหภูมิ (°C) 24 เกณฑ์การยอมรับ 23.0 ± 3.0
ความชื้นสัมพัทธ์ (%) 47 เกณฑ์การยอมรับ 50.0 ± 15.0
วันที่ทวนสอบ 23/04/66

การทวนสอบหลังจากออกจำหน่าย

อุณหภูมิ (°C) 24 เกณฑ์การยอมรับ 23.0 ± 3.0
ความชื้นสัมพัทธ์ (%) 49 เกณฑ์การยอมรับ 50.0 ± 15.0
วันที่ทวนสอบ 29/04/66

Item	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0dB)	Item	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0dB)
1	93.8	113.8	1	93.8	113.8
2	93.8	113.8	2	93.8	113.8
3	93.8	113.8	3	93.8	113.8
4	93.8	113.8	4	93.8	113.8
5	93.8	113.8	5	93.8	113.8
6	93.8	113.8	6	93.8	113.8
7	93.8	113.8	7	93.8	113.8
8	93.8	113.8	8	93.8	113.8
9	93.8	113.8	9	93.8	113.8
10	93.8	113.8	10	93.8	113.8
Σ	93.80	113.80	Σ	93.80	113.80
SD	0.00	0.00	SD	0.00	0.00
%RSD (≤ 10)	0.00	0.00	%RSD (≤ 10)	0.00	0.00
ผลการ ทวนสอบ	ผ่าน	ผ่าน	ผลการ ทวนสอบ	ผ่าน	ผ่าน

ผู้บันทึก
ผู้ตรวจสอบ

ผู้บันทึก
ผู้ตรวจสอบ

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sindhorn Rd, Bangbunru, Bangplud Bangkok 10700 THAILAND.
Tel: 0-2435-8800 Fax: 0-2433-1679 e-mail: cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL22270
Pages : 1 of 9

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : ACO
Model : TYPE 6226 / Microphone 7052 / Preamp 115g -
Serial No. : 200051 / 75990 / -
ID No. :

Condition As Found : GOOD

Customer : WATER ANALYSIS CENTER CO., LTD.
1/94 MOO.5, T.EANHAM A.U-THAI,
AYUTHAYA 12130 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 10 NOVEMBER 2022
Calibration Date : 15-18 NOVEMBER 2022
Date of Issue : 18 NOVEMBER 2022

Calibrated by : Nathakorn Pitsupaisan

Approved by : *T. Petchu.*
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

QP-TS12-04-04-020664

SITHIPORN SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22270
Job No. : VC66AC0003
Pages : 2 of 9

Calibration Procedure : CP-AC-02

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EP-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EP-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP-04/02/65	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP-03/02/65	09-Feb-23
Digital Multimeter	8846A	MY60024273	EEL-BP-05/02/65	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EP-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA1	34560495	AA-3005-22	22-Feb-23

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

SITHIPORN SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL22270
Job No. : VC66AC0003
Pages : 3 of 9

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity including the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

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QP-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22270
Job No. : VC66AC0003
Pages : 4 of 9

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limits (dB)
93.9 (93.95)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
37.5

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

Frequency Weighting	Measured value (dB)
A-weight	37.5
C-weight	37.5
Flat	37.5

3. Acoustical signal tests of frequency weightings

Motor free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.0	0.1	0.0	±1.5
1000	0.0	0.0	-0.1	±1.0
8000	0.7	0.8	0.6	±5.0

QP-TS12-04-04-020664

T. Reth.

Continuation of Calibration Certificate

Cert. No. : ACL22270
Job No. : VC66AC0003
Pages : 5 of 9

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.1	0.0	±2.0
125	0.1	0.1	0.2	±1.5
250	0.1	0.1	0.1	±1.5
500	0.0	0.1	0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	-0.1	±2.0
4000	-0.1	-0.2	-0.3	±3.0
8000	-0.2	-0.1	-0.2	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	0.0	-
C-weight	94.0	0.0	±0.2
Flat	94.1	0.1	±0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	±0.1
Leq	94.0	0.0	±0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	±0.3

QP-TS12-04-04-020664

T. Reth.

Continuation of Calibration Certificate

Cert. No. : ACL22270
Job No. : VC66AC0003
Pages : 6 of 9

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
133.0	132.9	-0.1	±1.1
132.0	131.9	-0.1	±1.1
131.0	130.9	-0.1	±1.1
129.0	128.9	-0.1	±1.1
124.0	123.9	-0.1	±1.1
119.0	118.9	-0.1	±1.1
114.0	113.9	-0.1	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	98.9	-0.1	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.0	0.0	±1.1
79.0	79.0	0.0	±1.1
74.0	73.9	-0.1	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1

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T. Reth.

Continuation of Calibration Certificate

Cert. No. : ACL22270
Job No. : VC66AC0003
Pages : 7 of 9

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±0.5
120	94.0	94.1	0.1	±0.5
110	94.0	94.0	0.0	±0.5
100	94.0	94.0	0.0	±0.5
90	94.0	94.0	0.0	±0.5

Level linearity on each level range

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	44.0	44.1	0.1	±0.5
120	34.0	34.0	0.0	±0.5

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5 ; -5.0
	2	8	117.0	116.4	-0.6	1.0 ; -2.5
	200	800	134.0	133.9	-0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	99.2	0.2	1.5 ; -5.0
	2	8	108.0	108.3	0.3	1.0 ; -2.5
	200	800	128.0	128.2	0.2	±1.0

QP-TS12-04-04-020664

T. Reth.

Continuation of Calibration Certificate

Cert. No. : ACL22270
Job No. : VC66AC0083
Pages : 8 of 9

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Espeak (dB)	Deviated Value, (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.0	-0.4	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
90.8	91	0.2	±1.5

QF-TS12-04-04-020664

T. Petchu.

Continuation of Calibration Certificate

Cert. No. : ACL22270
Job No. : VC66AC0083
Pages : 9 of 9

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k=2$
or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QF-TS12-04-04-020664

T. Petchu.

W	FO.LAB 6.4-1 /28	มาถึงวันที่ : 0	วันที่บังคับใช้ : 1 ม.ค. 2562	หน้า : 1 ของ 1
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แบบบันทึกการตรวจสอบเครื่อง Sound Level Meter

เครื่อง CA111 Sound Calibrator S/N 520272	รหัสเครื่องมือ SR004	ผลการสอบรับ 93.77 ± 0.3, 113.84 ± 0.3
วันที่สอบเทียบ 24/05/65	วันที่สอบเทียบครั้งต่อไป 23/05/66	
เครื่อง Digital Thermohygro Meter S/N 105091609	รหัสเครื่องมือ WWL 0055	
วันที่สอบเทียบ 30/11/65	วันที่สอบเทียบครั้งต่อไป 29/11/66	
เครื่อง Sound Level Meter S/N 200052	รหัสเครื่องมือ WWL 0207	
วันที่สอบเทียบ 15-18/11/65	วันที่สอบเทียบครั้งต่อไป 14/11/67	
การตรวจสอบก่อนออกใช้งาน	การตรวจสอบก่อนออกใช้งาน	
อุณหภูมิ (°C) 24	อุณหภูมิ (°C) 24	ผลการสอบรับ 23.04 ± 0.3
ความชื้นสัมพัทธ์ (%) 47	ความชื้นสัมพัทธ์ (%) 49	ผลการสอบรับ 30.0 ± 1.0
วันที่ตรวจสอบ 23/04/66	วันที่ตรวจสอบ 29/04/66	

Item	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0dB)	Item	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0dB)
1	93.8	113.8	1	93.8	113.8
2	93.8	113.8	2	93.8	113.8
3	93.8	113.8	3	93.8	113.8
4	93.8	113.8	4	93.8	113.8
5	93.8	113.8	5	93.8	113.8
6	93.8	113.8	6	93.8	113.8
7	93.8	113.8	7	93.8	113.8
8	93.8	113.8	8	93.8	113.8
9	93.8	113.8	9	93.8	113.8
10	93.8	113.8	10	93.8	113.8
X	93.80	113.80	X	93.80	113.80
SD	0.00	0.00	SD	0.00	0.00
%RSD (≤ 10)	0.00	0.00	%RSD (≤ 10)	0.00	0.00
ผลการ ตรวจสอบ	ผ่าน	ผ่าน	ผลการ ตรวจสอบ	ผ่าน	ผ่าน

ผู้บันทึก 2/2/65
ผู้ตรวจสอบ

ผู้บันทึก 2/2/65
ผู้ตรวจสอบ

SITHIPORN ASSOCIATES CO.,LTD.
CALIBRATION LABORATORY

451-451/1 Srinthorn Rd.,Bangmuang, Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2433-1679 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL22271
Pages : 1 of 9

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : ACO
Model : TYPE 6226 / Microphone 7052 / Pre-amplifier -
Serial No. : 200052 / 75988 / -
ID No. :

Condition As Found : GOOD

Customer : WATER ANALYSIS CENTER CO., LTD.
1/94 MOO.5, T.KANHAM A.U-THAI,
AYUTHAYA 12130 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 10 NOVEMBER 2022
Calibration Date : 15-18 NOVEMBER 2022
Date of Issue : 18 NOVEMBER 2022

Calibrated by : Nathakorn Pimupaisan

Approved by :

T. Petchu.
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced
other than in full, except with the prior written approval of the head of Calibration Laboratory.

QF-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : ACL22271
Job No. : VC66AC0003
Pages : 2 of 9

Calibration Procedure : CP-AC-02

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.
For tests results of each items were made by observation of each Instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EP-0007-22	04-Feb-23
Waveform Generator	33511B	MY52302742	EP-0008-22	04-Feb-23
Digital Multimeter	33461A	MY53220104	EEL-BP.04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	EEL-BP.03/0265	09-Feb-23
Digital Multimeter	8846A	MY60024273	EEL-BP.05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EP-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA1	34560495	AA-3005-22	22-Feb-23

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

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

3.1 National Institute of Metrology (Thailand).

3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QP-TS12-04-04-020664

7. Retch.

Continuation of Calibration Certificate

Cert. No. : ACL22271
Job No. : VC66AC0003
Pages : 3 of 9

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

QP-TS12-04-04-020664

7. Retch.

Continuation of Calibration Certificate

Cert. No. : ACL22271
Job No. : VC66AC0003
Pages : 4 of 9

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
37.5

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

Frequency Weighting	Measured value (dB)
A-weight	37.5
C-weight	37.5
Flat	37.5

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	-0.2	-0.2	-0.2	± 1.5
1000	-0.2	-0.3	-0.3	± 1.0
8000	0.9	1.0	0.9	± 0.0

QP-TS12-04-04-020664

7. Retch.

Continuation of Calibration Certificate

Cert. No. : ACL22271
Job No. : VC66AC0003
Pages : 5 of 9

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.1	±2.0
125	0.1	0.1	0.2	±1.5
250	0.1	0.1	0.2	±1.5
500	0.1	0.0	0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	-0.1	-0.1	±2.0
4000	-0.1	-0.2	-0.3	±3.0
8000	-0.2	-0.1	-0.2	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	0.0	± 0.2
C-weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	± 0.1
Leq	94.0	0.0	± 0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	94.0	94.0	0.0	± 0.3

QP-TS12-04-04-020664

7. Retch.

Continuation of Calibration Certificate

Cert. No. : ACL22271
Job No. : VC66AC0003
Pages : 6 of 9

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
133.0	132.9	-0.1	±1.1
132.0	131.9	-0.1	±1.1
131.0	130.9	-0.1	±1.1
129.0	128.9	-0.1	±1.1
124.0	123.9	-0.1	±1.1
119.0	118.9	-0.1	±1.1
114.0	113.9	-0.1	±1.1
109.0	109.0	0.0	±1.1
104.0	104.0	0.0	±1.1
99.0	98.9	-0.1	±1.1
94.0	94.0	0.0	±1.1
89.0	89.0	0.0	±1.1
84.0	84.1	0.1	±1.1
79.0	79.1	0.1	±1.1
74.0	74.0	0.0	±1.1
69.0	69.0	0.0	±1.1
64.0	64.0	0.0	±1.1
59.0	59.0	0.0	±1.1
54.0	54.0	0.0	±1.1
49.0	49.0	0.0	±1.1
44.0	44.0	0.0	±1.1

Continuation of Calibration Certificate

Cert. No. : ACL22271
Job No. : VC66AC0003
Pages : 7 of 9

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±0.5
120	94.0	94.1	0.1	±0.5
110	94.0	94.0	0.0	±0.5
100	94.0	94.0	0.0	±0.5
90	94.0	94.0	0.0	±0.5

Level linearity on each level range

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	44.0	44.1	0.1	±0.5
120	34.0	34.0	0.0	±0.5

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	106.4	-1.6	1.5; -5.0
	2	8	117.0	116.4	-0.6	1.0; -2.5
	200	800	134.0	133.8	-0.2	±1.0
Slow	2	8	108.0	107.8	-0.2	1.5; -5.0
	200	800	127.6	127.5	-0.1	±1.0
SEL	0.25	1	99.0	99.2	0.2	1.5; -5.0
	2	8	108.0	108.4	0.4	1.0; -2.5
	200	800	128.0	128.3	0.3	±1.0

QP-TS12-04-04-020664

T. Rth.

QP-TS12-04-04-020664

T. Rth.

Continuation of Calibration Certificate

Cert. No. : ACL22271
Job No. : VC66AC0003
Pages : 8 of 9

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.0	-0.4	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.1	-0.3	±2.0
Negative half cycle	135.4	135.1	-0.3	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
90.5	90.7	0.2	±1.5

Continuation of Calibration Certificate

Cert. No. : ACL22271
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Pages : 9 of 9

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor $k = 2$ or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate

QP-TS12-04-04-020664

T. Rth.

QP-TS12-04-04-020664

T. Rth.

W	PO LAB 64-1 /28	บริษัท สห : 0	วันที่รับเข้าใช้ : 1 มี.ค. 2562	หน้า : 1 ของ 1
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แบบบันทึกการทวนสอบเครื่องวัด Sound Level Meter

เครื่อง CA111 Sound Calibrator S/N 520272	วันที่สอบเทียบ 23/05/66	เครื่อง Digital Thermohygro Meter S/N 105091609	วันที่สอบเทียบ 29/11/66
วันที่สอบเทียบ 24/05/65	วันที่สอบเทียบเครื่องวัดเสียง 23/05/66	วันที่สอบเทียบเครื่องวัดเสียง 29/11/66	วันที่สอบเทียบเครื่องวัดเสียง 14/11/67
เครื่อง Sound Level Meter S/N 200053	วันที่สอบเทียบ 23/04/66	วันที่สอบเทียบ 23/04/66	วันที่สอบเทียบ 23/04/66
ความชื้นสัมพัทธ์ (%) 47	ความชื้นสัมพัทธ์ (%) 49	ความชื้นสัมพัทธ์ (%) 50.0 ± 15.0	ความชื้นสัมพัทธ์ (%) 50.0 ± 15.0
อุณหภูมิ (°C) 24	อุณหภูมิ (°C) 24	อุณหภูมิ (°C) 23.0 ± 3.0	อุณหภูมิ (°C) 23.0 ± 3.0

Item	ระดับเสียงที่วัดได้ (dB) (ความถี่ที่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความถี่ที่ 114.0dB)	Item	ระดับเสียงที่วัดได้ (dB) (ความถี่ที่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความถี่ที่ 114.0dB)
1	93.8	113.8	1	93.8	113.8
2	93.8	113.8	2	93.8	113.8
3	93.8	113.8	3	93.8	113.8
4	93.8	113.8	4	93.8	113.8
5	93.8	113.8	5	93.8	113.8
6	93.8	113.8	6	93.8	113.8
7	93.8	113.8	7	93.8	113.8
8	93.8	113.8	8	93.8	113.8
9	93.8	113.8	9	93.8	113.8
10	93.8	113.8	10	93.8	113.8
X	93.80	113.80	X	93.80	113.80
SD	0.00	0.00	SD	0.00	0.00
%RSD (≤ 10)	0.00	0.00	%RSD (≤ 10)	0.00	0.00
หมายเหตุ	ผ่าน	ผ่าน	หมายเหตุ	ผ่าน	ผ่าน

ผู้บันทึก: *[Signature]* ผู้ตรวจสอบ: *[Signature]*

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Rd., Bangbunru, Bangkok 10700 THAILAND.
Tel:0-2435-8800 Fax:0-2435-1579 e-mail:cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL32272
Pages : 1 of 9

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : ACO
Model : TYPE 6226 / Microphone 7052 / Pre-amplifier -
Serial No. : 200053 / 75989 / -
ID No. :

Condition As Found : GOOD

Customer : WATER ANALYSIS CENTER CO., LTD.
1/94 MOO.5, T.KANHAM A.U-THAI,
AYUTHAYA 12130 THAILAND.

Location : -
Ambient Temperature : (23.0 ± 3) °C
Pressure : (101.3 ± 3) kPa
Relative Humidity : (50.0 ± 20) %

Received Date : 10 NOVEMBER 2022
Calibration Date : 15-18 NOVEMBER 2022
Date of Issue : 18 NOVEMBER 2022

Calibrated by : Nathakorn Pimpraisan

Approved by : *[Signature]*
(Thanakul Petchurai)

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

QF-TS12-04-04-020664

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL32272
Job No. : VC66AC0003
Pages : 2 of 9

Calibration Procedure : CP-AC-02

Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).
The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Acoustic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each instruments display and also with SLM's display.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Exp. Date
Waveform Generator	33210A	MY48017076	EP-0007-22	04-Feb-23
Waveform Generator	33511B	MY53202742	EP-0008-22	09-Feb-23
Digital Multimeter	33461A	MY53220104	BHL-BP-04/0265	09-Feb-23
Digital Multimeter	33461A	MY53220076	BHL-BP-03/0265	09-Feb-23
Digital Multimeter	8846A	MY60024273	BHL-BP-05/0265	09-Feb-23
Programmable Attenuator	MAT-1070	62100114	EP-0009-22	07-Feb-23
Condenser Microphone	4180	2977900	AA-1013-22	24-Feb-23
Measuring Amplifier	NA-42KA1	34560495	AA-3005-22	22-Feb-23

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

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

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

Continuation of Calibration Certificate

Cert. No. : ACL32272
Job No. : VC66AC0003
Pages : 3 of 9

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	-	-	-	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

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Continuation of Calibration Certificate

Cert. No. : ACL22272
Job No. : VC66AC0003
Pages : 4 of 9

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.95)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
37.5

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

Frequency Weighting	Measured value (dB)
A - weight	37.5
C - weight	37.5
Flat	37.5

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	-0.1	-0.1	0.0	± 1.5
1000	-0.2	-0.3	-0.2	± 1.0
8000	0.4	0.4	0.3	±5.0

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22272
Job No. : VC66AC0003
Pages : 5 of 9

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.1	0.3	±2.0
125	0.1	0.2	0.4	±1.5
250	0.1	0.0	0.3	±1.5
500	0.0	0.1	0.2	±1.5
1000	0.0	0.0	0.0	±1.0
2000	-0.1	0.0	-0.1	±2.0
4000	-0.1	-0.2	-0.3	±3.0
8000	-0.3	-0.1	-0.2	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	0.0	-
C - weight	93.9	-0.1	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	94.0	0.0	-
Slow	94.0	0.0	± 0.1
Leq	94.0	0.0	± 0.1

6. Long-term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.3

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22272
Job No. : VC66AC0003
Pages : 6 of 9

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
133.0	132.9	-0.1	± 1.1
132.0	131.9	-0.1	± 1.1
131.0	130.9	-0.1	± 1.1
129.0	128.9	-0.1	± 1.1
124.0	123.9	-0.1	± 1.1
119.0	118.9	-0.1	± 1.1
114.0	113.9	-0.1	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	98.9	-0.1	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.1	0.1	± 1.1
79.0	79.1	0.1	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1

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T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22272
Job No. : VC66AC0003
Pages : 7 of 9

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±0.5
120	94.0	94.1	0.1	±0.5
110	94.0	94.0	0.0	±0.5
100	94.0	94.0	0.0	±0.5
90	94.0	94.0	0.0	±0.5

Level linearity on each level range

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	44.0	44.1	0.1	±0.5
120	34.0	34.1	0.1	±0.5

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5 ; -5.0
	2	8	117.0	116.6	-0.4	1.0 ; -2.5
	200	800	134.0	133.9	-0.1	±1.0
Slow	2	8	108.0	108.1	0.1	1.5 ; -5.0
	200	800	127.6	127.7	0.1	±1.0
SEL	0.25	1	99.0	99.2	0.2	1.5 ; -5.0
	2	8	108.0	108.4	0.4	1.0 ; -2.5
	200	800	128.0	127.9	-0.1	±1.0

QF-TS12-04-04-020664

T. Petch

Continuation of Calibration Certificate

Cert. No. : ACL22272
Job No. : VC66AC0003
Pages : 8 of 9

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	136.0	-0.4	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	133.1	-0.3	±2.0
Negative half cycle	135.4	133.1	-0.3	±2.0

11. Overload indication

Measured value (dB)	Deviated Value	Acceptance Limits
Positive one-half cycle	Negative one-half cycle	
90.5	90.6	0.1
		±1.5

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Continuation of Calibration Certificate

Cert. No. : ACL22272
Job No. : VC66AC0003
Pages : 9 of 9

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

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

End of Calibration Certificate

QP-TS12-04-04-020664

W	POLLAB 64-1/28	วันที่ตรวจ : 0	วันที่บังคับใช้ : 1 ส.ค. 2562	หน้า : 1 ของ 1
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แบบบันทึกการตรวจสอบเครื่อง Sound Level Meter

เครื่อง CA111 Sound Calibrator S/N 520272	วันที่ตรวจ : 0	SR004	ผลการตรวจ : 93.77 ± 0.3, 113.84 ± 0.3
วันที่สอบเทียบ : 24/05/65	วันที่สอบเทียบครั้งต่อไป : 23/05/66		
เครื่อง Digital Thermohygrometer S/N 105091609	วันที่ตรวจ : 0	W/L 0055	ผลการตรวจ : 29/11/66
วันที่สอบเทียบ : 30/11/65	วันที่สอบเทียบครั้งต่อไป : 29/11/66		
เครื่อง Sound Level Meter S/N 00296801	วันที่ตรวจ : 0	W/L 0159	ผลการตรวจ : 12/06/67
วันที่สอบเทียบ : 13-14/06/65	วันที่สอบเทียบครั้งต่อไป : 12/06/67		

การตรวจสอบห้องสอบเทียบ

อุณหภูมิ (°C) 24	ผลการตรวจ : 23.0 ± 3.0	อุณหภูมิ (°C) 24	ผลการตรวจ : 23.0 ± 3.0
ความชื้นสัมพัทธ์ (%) 47	ผลการตรวจ : 50.0 ± 15.0	ความชื้นสัมพัทธ์ (%) 49	ผลการตรวจ : 50.0 ± 15.0
วันที่ตรวจ : 23/04/66	วันที่ตรวจ : 23/04/66		

Item	ระดับเสียงที่วัดได้ (dB) (ความถี่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความถี่ 114.0dB)	Item	ระดับเสียงที่วัดได้ (dB) (ความถี่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความถี่ 114.0dB)
1	93.8	113.8	1	93.8	113.8
2	93.8	113.8	2	93.8	113.8
3	93.8	113.8	3	93.8	113.8
4	93.8	113.8	4	93.8	113.8
5	93.8	113.8	5	93.8	113.8
6	93.8	113.8	6	93.8	113.8
7	93.8	113.8	7	93.8	113.8
8	93.8	113.8	8	93.8	113.8
9	93.8	113.8	9	93.8	113.8
10	93.8	113.8	10	93.8	113.8
X	93.80	113.80	X	93.80	113.80
SD	0.00	0.00	SD	0.00	0.00
%RSD (≤ 10)	0.00	0.00	%RSD (≤ 10)	0.00	0.00
ผลการตรวจ	ผ่าน	ผ่าน	ผลการตรวจ	ผ่าน	ผ่าน

ผู้บันทึก : *[Signature]* ผู้ตรวจ : *[Signature]*
ผู้ตรวจสอบ : *[Signature]* ผู้ตรวจ : *[Signature]*



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0506

MTC No. REL., BP. 59/0565

CALIBRATION CERTIFICATE

Submitted by : WATER ANALYSIS CENTER CO., LTD.

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

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

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

Instrument Calibrated :	Ambient Environment
Description : Sound Level Meter	Temperature : (23 ± 3) °C
Manufacturer : Rion	Relative Humidity : (50 ± 15) %
Model : NL-42	Ambient Pressure : (101.325 ± 1.5) kPa
Serial No. : 00396801	
Microphone : Type UC-52 No.180447	
Preamplifier : Type NH-24 No.87812	

Standards used :

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

Date of Receipt : 20 May 2022

Date of Calibration : 13-14 Jun. 2022

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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.

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

Office/Laboratory : Soi 1C, Bangpoo Industrial Estate, Sukhumvit Road, Amphoe Muang, Chongchad, Samutprakan 10280, Thailand
Tel. (66) 0 2323 1672-40 ext. 115, 116
Fax. (66) 0 2323 9165
E-mail : mtc@tistr.or.th

Office : 136 Phahonyothin Road, Chatuchak, Bangkok 10900, Thailand
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5217
Fax. (66) 0 2579 6392
E-mail : sura@tistr.or.th

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

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

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

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

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

Date of Calibration : 13-14 Jun. 2022

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FIABL.MTC.002 Rev.4

Head Office
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E-mail : suramee@tistr.or.th

1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Unit Under Test				Tolerance Limit Class 2 (±dB)
	Measured Value (dB)	Deviation (dB)	Uncertainty (±dB)	Limit Class 2 (±dB)	
113.88	113.7	113.9	0.0	0.30	1.4

Note: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 124.9 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (±dB)
18.6	0.10

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

Frequency Weighting	Measured Value (dB)	Uncertainty (±dB)
A-Weighting	13.1	0.10
C-Weighting	18.7	0.10
Flat	24.2	0.10

Date of Calibration : 13-14 Jun. 2022

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3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from response curve			Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
	A-weighting (dB)	C-weighting (dB)	Flat (dB)		
125	-0.3	-0.2	-0.2	0.40	2.0
1 000	0.2	0.2	0.2	0.40	1.4
4 000	0.3	0.3	0.3	0.40	3.6

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from response curve			Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
	A-weighting (dB)	C-weighting (dB)	Flat (dB)		
63	0.0	-0.1	0.0	0.20	2.5
125	-0.1	0.0	0.0	0.20	2.0
250	-0.1	0.0	0.0	0.20	1.9
500	-0.1	0.0	0.0	0.20	1.9
1 000	0.0	0.0	0.0	0.20	1.4
2 000	0.0	0.0	0.0	0.20	2.6
4 000	0.0	0.0	0.0	0.20	3.6
8 000	0.1	0.1	0.0	0.20	5.6

Date of Calibration : 13-14 Jun. 2022

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5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
A-weighting	94.0	0.0	0.20	0.4
C-weighting	94.0	0.0	0.20	0.4
Flat	94.0	0.0	0.20	0.4

5.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
Fast	94.0	0.0	0.20	0.3
Slow	94.0	0.0	0.20	0.3
Leq	94.0	0.0	0.20	0.3

6. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
137	137.0	0.0	0.30	1.4
136	136.0	0.0	0.30	1.4
135	135.0	0.0	0.30	1.4
134	134.0	0.0	0.30	1.4
133	133.0	0.0	0.30	1.4
132	132.0	0.0	0.30	1.4
131	131.0	0.0	0.30	1.4

Date of Calibration : 13-14 Jun. 2022

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

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
130	130.0	0.0	0.30	1.4
129	129.0	0.0	0.30	1.4
124	124.0	0.0	0.30	1.4
119	119.0	0.0	0.30	1.4
114	114.0	0.0	0.30	1.4
109	109.0	0.0	0.30	1.4
104	104.0	0.0	0.30	1.4
99	99.0	0.0	0.30	1.4
94	94.0	0.0	0.30	1.4
89	89.0	0.0	0.30	1.4
84	84.1	0.1	0.30	1.4
79	79.0	0.0	0.30	1.4
74	74.0	0.0	0.30	1.4
69	69.0	0.0	0.30	1.4
64	64.0	0.0	0.30	1.4
59	59.0	0.0	0.30	1.4
54	53.9	-0.1	0.30	1.4
49	49.0	0.0	0.30	1.4
44	44.0	0.0	0.30	1.4
39	38.9	-0.1	0.30	1.4
34	34.0	0.0	0.30	1.4
29	29.0	0.0	0.30	1.4
28	28.0	0.0	0.30	1.4

Date of Calibration : 13-14 Jun. 2022

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

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
27	27.0	0.0	0.30	1.4
26	25.9	-0.1	0.30	1.4
25	24.9	-0.1	0.30	1.4

7. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
20-130	125	125.0	0.0	0.30	1.4

8. Tone burst response

Time Weighting	Toneburst Duration, Tb (ms)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (dB)
Fast	200	126.0	0.0	0.20	±1.3
	2	108.9	-0.1	0.20	+1.3; -2.8
	0.25	99.8	-0.2	0.20	+1.8; -5.3
Slow	200	119.5	-0.1	0.20	±1.3
	2	99.9	-0.1	0.20	+1.3; -5.3
	200	120.0	0.0	0.20	±1.3
SEL	2	99.9	-0.1	0.20	+1.3; -2.8
	0.25	90.8	-0.2	0.20	+1.8; -5.3

Date of Calibration : 13-14 Jun. 2022

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9. Peak C sound level



Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (±dB)	Tolerance limits Class 2 (±dB)
Complete cycle	125.4	125.4	0.0	0.20	2.4
Positive half cycle	124.4	124.1	-0.3	0.20	1.4
Negative half cycle	124.4	124.1	-0.3	0.20	1.4

10. Overload indication

Measured value (dB)		Deviated value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
Positive one-half cycle	Negative one-half cycle			
136.4	136.4	0.0	0.30	1.8

Calibrated by :

Approved by :


(Mr. Pannasit Phasingern)

(Mr. Tawikrit Jansamran)

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 13-14 Jun. 2022

Date of Issue : 15 Jun. 2022

Ref: 2011265052002210002

End of Certificate

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W	FO.LAB 64-1/28	วันที่ตรวจวัด : 8	วันที่บังคับใช้ : 1 เม.ย. 2563	หน้า : 1 ของ 1
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แบบบันทึกการทวนสอบเครื่อง Sound Level Meter

เครื่อง CA111 Sound Calibrator S/N 520272	รหัสเครื่องวัด SR004	เลขจำการสอบรับ 93.77 ± 0.3, 113.84 ± 0.3
วันที่สอบเทียบ 24/05/65	วันที่สอบเทียบเครื่องวัดไป 23/05/66	
เครื่อง Digital Thermohygro Meter S/N 105091609	รหัสเครื่องวัด WVL 0055	
วันที่สอบเทียบ 30/11/65	วันที่สอบเทียบเครื่องวัดไป 29/11/66	
เครื่อง Sound Level Meter S/N 00396803	รหัสเครื่องวัด PWL 0160	
วันที่สอบเทียบ 13-16/12/64	วันที่สอบเทียบเครื่องวัดไป 12/12/66	

การทวนสอบก่อนออกจำหน่าย



อุณหภูมิ (°C) 24	เลขจำการสอบรับ 23.0±3.0
ความชื้นสัมพัทธ์ (%) 47	เลขจำการสอบรับ 50.0±15.0
วันที่ทวนสอบ 23/04/66	

การทวนสอบหลังจากรับเข้าใช้งาน

อุณหภูมิ (°C) 24	เลขจำการสอบรับ 23.0±3.0
ความชื้นสัมพัทธ์ (%) 49	เลขจำการสอบรับ 50.0±15.0
วันที่ทวนสอบ 29/04/66	

Item	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0dB)	Item	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 94.0dB)	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0dB)
1	93.8	113.8	1	93.8	113.8
2	93.8	113.8	2	93.8	113.8
3	93.8	113.8	3	93.8	113.8
4	93.8	113.8	4	93.8	113.8
5	93.8	113.8	5	93.8	113.8
6	93.8	113.8	6	93.8	113.8
7	93.8	113.8	7	93.8	113.8
8	93.8	113.8	8	93.8	113.8
9	93.8	113.8	9	93.8	113.8
10	93.8	113.8	10	93.8	113.8
X	93.80	113.80	X	93.80	113.80
SD	0.00	0.00	SD	0.00	0.00
%RSD (≤ 10)	0.00	0.00	%RSD (≤ 10)	0.00	0.00
ผู้ตรวจ	ผ่าน	ผ่าน	ผู้ตรวจ	ผ่าน	ผ่าน
ทวนสอบ			ทวนสอบ		

ผู้บันทึก 
ผู้ตรวจสอบ 

ผู้บันทึก 
ผู้ตรวจสอบ 



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0137

MTC No. EEL. BP. 105/1164

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.

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

Instrument Calibrated : Ambient Environment
Description : Sound Level Meter Temperature : $(23 \pm 3) ^\circ\text{C}$
Manufacturer : Rion Relative Humidity : $(50 \pm 15) \%$
Model : NL-42 Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$
Serial No. : 00396803 (WWL 0160)
Microphone : Type UC-52 No.180449
Preamplifier : Type NH-24 No.87814

Standards used :

1. Band Pass Filter Stanford Research Systems SR 650 S/N 28712.
2. Condenser Microphone Brüel&Kjær 4180 S/N 2889871.
3. Decade Attenuator Ando AL-205 S/N 00464602.
4. Function/Arbitrary Waveform Generator Agilent 33220A S/N MY44042668.
5. Digital Function Synthesizer NF Electronic Instruments DF-193A S/N 122037.
6. Digital Multimeter Fluke 8520A S/N 4985007.
7. Pistonphone Rion NC-72 S/N 00402446.
8. Measuring Amplifier Brüel&Kjær 2636 S/N 1537484.

Date of Receipt : 26 Nov. 2021

Date of Calibration : 13-16 Dec.2021

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0137

MTC No. EEL. BP. 105/1164

1. Absolute Sensitivity

Reference	Unit Under Test				Tolerance
Acoustic Signal (dB)	Measured Value (dB)		Deviation (dB)	Uncertainty (±dB)	Limits Class 2 (±dB)
	Before adjust	After adjust			
113.91	114.1	113.9	0.0	0.30	1.4

Notes: The external calibration adjustment was firstly performed. The internal calibration adjustment was then completed at the display of 113.9 dB.

2. Self-generated noise

2.1 Normal test

Measured value (dB)	Uncertainty (\pm dB)
16.5	0.10

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

Frequency Weighting	Measured Value (dB)	Uncertainty (\pm dB)
A-Weighting	12.6	0.10
C-Weighting	17.8	0.10
Flat	23.2	0.10

Date of Calibration : 13-16 Dec.2021

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0137

MTC No. EEL. BP. 105/1164

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

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). These calibration procedures were related to the electrical and acoustic signal tests. The electrical signal test was carried out with the direct measurement method. The acoustic signal test was performed in an anechoic room with the comparison measurement method.

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

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

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

Date of Calibration : 13-16 Dec.2021

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0137

MTC No. EEL. BP. 105/1164

3. Acoustical signal test of frequency weightings

Frequency (Hz)	Deviation from response curve			Uncertainty (\pm dB)	Tolerance Limits Class 2 (\pm dB)
	A-weighting (dB)	C-weighting (dB)	Flat (dB)		
125	-0.2	-0.1	-0.1	0.40	2.0
1 000	-0.1	-0.1	-0.1	0.40	1.4
4 000	-0.8	-0.7	-0.7	0.40	3.6

4. Electrical signal test of frequency weightings

Frequency (Hz)	Deviation from response curve			Uncertainty (\pm dB)	Tolerance Limits Class 2 (\pm dB)
	A-weighting (dB)	C-weighting (dB)	Flat (dB)		
63	0.0	-0.1	-0.1	0.20	2.5
125	-0.1	0.0	-0.1	0.20	2.0
250	0.0	0.0	0.0	0.20	1.9
500	0.0	0.0	0.0	0.20	1.9
1 000	0.0	0.0	0.0	0.20	1.4
2 000	-0.1	0.0	-0.1	0.20	2.6
4 000	0.0	0.0	0.0	0.20	3.6
8 000	0.1	0.1	0.0	0.20	5.6

Date of Calibration : 13-16 Dec.2021

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FAIRL/MTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0137

MTC No. EEL. BP. 105/1164

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
A-weighting	94.0	0.0	0.20	0.4
C-weighting	94.0	0.0	0.20	0.4
Flat	94.0	0.0	0.20	0.4

5.2 Time weightings at 1 kHz

Frequency Weighting	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
Fast	94.0	0.0	0.20	0.3
Slow	94.0	0.0	0.20	0.3
Leq	94.0	0.0	0.20	0.3

6. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
137	137.0	0.0	0.30	1.4
136	136.1	0.1	0.30	1.4
135	135.0	0.0	0.30	1.4
134	134.1	0.1	0.30	1.4
133	133.1	0.1	0.30	1.4
132	132.0	0.0	0.30	1.4
131	131.0	0.0	0.30	1.4

Date of Calibration : 13-16 Dec.2021

5/8

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0137

MTC No. EEL. BP. 105/1164

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

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
130	130.0	0.0	0.30	1.4
129	129.0	0.0	0.30	1.4
124	124.0	0.0	0.30	1.4
119	119.0	0.0	0.30	1.4
114	114.0	0.0	0.30	1.4
109	109.0	0.0	0.30	1.4
104	104.0	0.0	0.30	1.4
99	99.0	0.0	0.30	1.4
94	94.0	0.0	0.30	1.4
89	89.0	0.0	0.30	1.4
84	84.1	0.1	0.30	1.4
79	79.0	0.0	0.30	1.4
74	74.0	0.0	0.30	1.4
69	69.0	0.0	0.30	1.4
64	64.0	0.0	0.30	1.4
59	59.0	0.0	0.30	1.4
54	54.0	0.0	0.30	1.4
49	48.9	-0.1	0.30	1.4
44	44.0	0.0	0.30	1.4
39	39.0	0.0	0.30	1.4
34	34.0	0.0	0.30	1.4
29	28.9	-0.1	0.30	1.4
28	28.0	0.0	0.30	1.4

Date of Calibration : 13-16 Dec.2021

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Request No. 21-65/0137

MTC No. EEL. BP. 105/1164

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

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
27	27.0	0.0	0.30	1.4
26	25.9	-0.1	0.30	1.4
25	25.0	0.0	0.30	1.4

7. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
20-130	125	125.0	0.0	0.30	1.4

8. Tone burst response

Time Weighting	Toneburst Duration, Tb	Measured Value	Deviated Value	Uncertainty	Tolerance Limits Class 2
	(ms)	(dB)	(dB)	(±dB)	(dB)
Fast	200	126.0	0.0	0.20	±1.3
	2	109.0	0.0	0.20	+1.3; -2.8
	0.25	99.9	-0.1	0.20	+1.8; -5.3
Slow	200	119.5	-0.1	0.20	±1.3
	2	99.9	-0.1	0.20	+1.3; +5.3
SEL	200	120.0	0.0	0.20	±1.3
	2	100.0	0.0	0.20	+1.3; -2.8
	0.25	90.9	-0.1	0.20	+1.8; -5.3

Date of Calibration : 13-16 Dec.2021

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Request No. 21-65/0137

MTC No. EEL. BP. 105/1164

9. Peak C sound level

Number of cycles in test signal	Anticipated value (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (±dB)	Tolerance limits Class 2 (±dB)
Complete cycle	125.4	125.4	0.0	0.20	2.4
Positive half cycle	124.4	124.1	-0.3	0.20	1.4
Negative half cycle	124.4	124.1	-0.3	0.20	1.4

10. Overload indication

Measured value (dB)	Deviated value (dB)	Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
Positive one-half cycle	Negative one-half cycle	0.0	0.30
136.6	136.6	0.0	1.8

Calibrated by :

Prinya Phasinger
(Mr. Prinya Phasinger)
Suk E
(Mr. Tewikist Jansamran)

Approved by :

Wit Pawanit Kiatpa
TISTR

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 13-16 Dec.2021

Date of Issue : 17 Dec. 2021

Ref : 201126411260499002

End of Certificate

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Certificate of System Qualification

GC-DQ + GCMS-DQ

System ID: RYQ_EN0136
Organization Name: ALS Laboratory Group (Thailand) Co Ltd.
Organization Location: 616/10 Moo 5, Tambol Mae Nam Koo, A.Pluakdaeng, Rayong, 21140, Thailand

Date: July 7, 2022 11:27:53 AM
EOP Name: Agilent Recommended, Agilent Recommended
EOP Revision: GC.02.52, GCMS.02.52
Overall Qualification Status: Pass

REVIEW BY: *N. Banniy*
APPROVED BY: *[Signature]*
NEXT CAL. DATE: 07/01/24

CDS Logon Verification - GC

Logon: *dejanachon*

Overall CDS Logon Verification - GC Test Status

Pass

System Inspection and Basic Safety and Operation

Name: 7890
Setpoint Status: Pass

Overall System Inspection and Basic Safety and Operation Test Status

Pass

Inlet Pressure Accuracy

Name: 7890
Front SSL
Setpoint Status: Pass
Setpoint: 25.0 psi Actual: 25.1 psi
Accuracy: 0.1 psi
Agilent Recommended: ≤ 1.2

Date: July 7, 2022 11:27:53 AM
System ID: RYQ_EN0136

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Overall Inlet Pressure Accuracy Test Status

Pass

GC Oven Temperature Accuracy

Name: 7890
Setpoint Status: Pass
Zone: Oven
Setpoint/Actual: 230.0 230.6 °C
Temperature: 230.0 230.6 °C
Accuracy: 0.6 °C
Agilent Recommended: ≥ -1.0 °C % setpoint in K (-5.0 °C)
 ≤ 1.0 °C % setpoint in K (5.0 °C)
Setpoint Status: Pass
Zone: Oven
Setpoint/Actual: 100.0 99.9 °C
Temperature: 100.0 99.9 °C
Accuracy: -0.1 °C
Agilent Recommended: ≥ -1.0 °C % setpoint in K (-3.7 °C)
 ≤ 1.0 °C % setpoint in K (3.7 °C)

Overall GC Oven Temperature Accuracy Test Status

Pass

GC Oven Temperature Stability

Name: 7890
Setpoint Status: Pass
Setpoint/Average: 100.0 99.91657 °C
Temperature: 100.0 99.91657 °C
Stability: 0.1 °C
Agilent Recommended: ≤ 0.5

Overall GC Oven Temperature Stability Test Status

Pass

Date: July 7, 2022 11:27:53 AM
System ID: RYQ_EN0136

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Log Amp

Tested Combination: Front SSL / External SQ
Name: 5977B
Setpoint Status: Pass
Overall Log Amp Test Status: Pass

RFPA

Tested Combination: Front SSL / External SQ
Name: 5977B
Setpoint Status: Pass
Amu: 1050 m/z
Drift After Five Minutes: 1.4 mV
RFPA Voltage: 479 mV
Agilent Recommended: ≥ -100 and ≤ 100 ≤ 1100

Overall RFPA Test Status

Pass

Tune EI

Tested Combination: Front SSL / External SQ
Name: 5977B
Setpoint Status: Pass
Filament: 1
Setpoint Status: Pass
Filament: 2

Overall Tune EI Test Status

Pass

Signal to Noise EI

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System ID: RYQ_EN0136

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Tested Combination: Front SSL / External SQ
Name: 5977B
Source: IEI - Extractor Filament: 1
Setpoint Status: Pass
Signal to Noise: 7485
Agilent Recommended: ≥ 1200
Source: IEI - Extractor Filament: 2
Setpoint Status: Pass
Signal to Noise: 2097
Agilent Recommended: ≥ 1200
This test's 2 comment(s) and 7 deviation(s) are available in the Attachments section.
Overall Signal to Noise EI Test Status: Pass

Date: July 7, 2022 11:27:53 AM
System ID: RYQ_EN0136

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Instrument Details

Purpose

This section describes the as found system configuration.

Details

System	
System ID	RYG_EN0130
Manufacturer	Agilent Technologies
Name	7890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

Tested Combination1

Injection Technique	Manual Injection
Inlet	Front
Detector	External
LTM Included?	No

Sampler 1

Manufacturer	Agilent Technologies
Type	Manual Injection
Usage	Sample Injection
Syringe Volume (µL)	10

Maldrarne 1

Manufacturer	Agilent Technologies
Name	7890
Model Number	G3442B
Serial Number	CN15453238
Firmware Revision	B.02.04.3
Component ID/Asset No.	061117000235
Oven Type	Standard

Date: July 7, 2022 11:27:53 AM
System ID: RYG_EN0138

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Electronic Signature

Purpose

This signature page was created and published because the ACE sign-off action was executed, which is valid for the email document, including attachments. The ACE sign-off is an electronic signature that requires two distinct identification components: unique username and personal password. The Agent representative who has delivered this service understands the meaning and legal status of an electronic signature. As a trained official operator, the Agent representative has a unique password and login to access ACE and electronically sign this document. (Other e-signatures can be applied to the document using a Document Content Management or other suitable method defined in your data access and control procedures.)

Dezile

Full Name of Signer:	Eaknarin Puangsopa
Logged On User Name:	eaknarin_puangsope@equient.com
Signature Creation Date:	July 7, 2022
Reason for Signature:	Executed protocol and published this original version of document

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System ID: RYG-ENG136

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Inlet 3

Manufacturer	Agilent Technologies
Name	7890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

Detector 1

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	SQ
Name	5977B
Serial Number	US1701M006
Firmware Revision	5977 8.00.34
High Vacuum System	Turbo Pump
Scouting Run Standard	OFH Std
Component ID/Asset No.	081117000236

MS E1 Source 1

Manufacturer	Agilent Technologies
Source Type	EI - Extractor
Number of filaments	2

Date: July 7, 2022 11:27:53 AM
System ID: RYG_END136

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Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 6, 2022 1:11:54 PM	Auth	Session Created	Session	None
July 6, 2022 1:11:54 PM	Start	Configuration	Session	None
July 6, 2022 1:11:54 PM	Auth	Estimation	Licensing	User is Managing and does not require any linkback code
July 6, 2022 1:17:19 PM	Auth	File Deleted	Session	<p>EOP details for primary scriptfile [0x4] - File path: [Photos\Pasha\Gals\Config\fore02.820x0x02.820x]</p> <p>EOP File Name: [0x02.820x0x02.820x]</p> <p>[0x02.820x0x02.820x] EOP Name: [0x02.820x0x02.820x]</p> <p>EOP details for logname\scriptfile [0x4] - File path: [Photos\Pasha\Gals\Config\scriptfile02.820x0x02.820x]</p> <p>scriptfile EOP File Name: [0x02.820x0x02.820x]</p> <p>BOF: Name: [0x02.820x0x02.820x]</p> <p>[0x02.820x0x02.820x]</p>
July 6, 2022 1:17:26 PM	End	Configuration	Session	None
July 6, 2022 1:17:28 PM	Start	Configuration	Session	OC
July 6, 2022 1:17:30 PM	Start	Execution	CDS Logon Validation - GC -	None - Qualitative test
July 6, 2022 1:19:43 PM	End	Execution	CDS Logon Validation - GC -	Run Count: 1 - Qualitative test
July 6, 2022 1:19:43 PM	Start	Execution	System Inspection and Basic Safety and Operation - T9000-	None
			Combinative Test - No separate test suite	

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System ID: RYG-ENG136

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Date: July 7, 2022 11:27:53 AM
System ID: RYG-EN0136

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User Name: seltzeris_jungseop
Hostname: ASRTY097902

System ID: RYQ_E01136
Print Date: July 7, 2022 11:27:54 AM

ALS_RYQ_E01136 Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 6, 2022 1:10:50 PM	End	Execution	System Inspection and Basic Safety and Operation - 7880 - Qualitative Test - No setpoints associated	Run Count: 1
July 6, 2022 1:20:18 PM	Start	Execution	Inlet Pressure Accuracy - Reptl SSL - Pressure Controlled Inlet - S: 29.9 psi - L: <= 1.2 psi	None
July 6, 2022 1:21:43 PM	End	Execution	Inlet Pressure Accuracy - Reptl SSL - Pressure Controlled Inlet - S: 29.9 psi - L: <= 1.2 psi	Run Count: 1
July 6, 2022 1:21:45 PM	Start	Execution	GC Oven Temperature Accuracy - 7880 - Temperature : Oven - S: 300.0°C - L: <= +1.0 AND <= 1.0 % setpoint in K	None
July 6, 2022 1:25:18 PM	Audit	Data	GC Oven Temperature Accuracy - 7880 - Temperature : Oven - S: 300.0°C - L: <= +1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
July 6, 2022 1:25:18 PM	End	Execution	GC Oven Temperature Accuracy - 7880 - Temperature : Oven - S: 300.0°C - L: <= +1.0 AND <= 1.0 % setpoint in K	Run Count: 1
July 6, 2022 1:26:17 PM	Start	Execution	GC Oven Temperature Accuracy - 7880 - Temperature : Oven - S: 300.0°C - L: <= +1.0 AND <= 1.0 % setpoint in K	None
July 6, 2022 1:26:22 PM	Start	Execution	GC Oven Temperature Accuracy - 7880 - Temperature : Oven - S: 300.0°C - L: <= +1.0 AND <= 1.0 % setpoint in K	None
July 6, 2022 1:33:42 PM	Audit	Data	GC Oven Temperature Accuracy - 7880 - Temperature : Oven - S: 300.0°C - L: <= +1.0 AND <= 1.0 % setpoint in K	Manual Data Entry

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Date: July 7, 2022 11:27:53 AM
System ID: RYQ_E01136

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User Name: seltzeris_jungseop
Hostname: ASRTY097902

System ID: RYQ_E01136
Print Date: July 7, 2022 11:27:54 AM

ALS_RYQ_E01136 Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 6, 2022 1:31:43 PM	End	Execution	GC Oven Temperature Accuracy - 7880 - Temperature : Oven - S: 300.0°C - L: <= +1.0 AND <= 1.0 % setpoint in K	Run Count: 1
July 6, 2022 1:32:45 PM	Start	Execution	GC Oven Temperature Stability - 7880 - Temperature : Oven - S: 300.0°C - L: <= 0.5°C	None
July 6, 2022 1:33:45 PM	Audit	Data	GC Oven Temperature Stability - 7880 - Temperature : Oven - S: 300.0°C - L: <= 0.5°C	Manual Data Entry
July 6, 2022 1:33:47 PM	End	Execution	GC Oven Temperature Stability - 7880 - Temperature : Oven - S: 300.0°C - L: <= 0.5°C	Run Count: 1
July 6, 2022 1:33:11 PM	Start	Execution	Log Amp - 9877B SQ - Source: None EI - Extractor	None
July 6, 2022 1:37:10 PM	End	Execution	Log Amp - 9877B SQ - Source: None EI - Extractor	Run Count: 1
July 6, 2022 1:37:24 PM	Start	Execution	RPPA - 9877B SQ - Source: EI None - Extractor	None
July 6, 2022 2:00:54 PM	End	Execution	RPPA - 9877B SQ - Source: EI None - Extractor	Run Count: 1
July 6, 2022 2:00:28 PM	Start	Execution	Tune EI - 9877B SQ - Source: None EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
July 6, 2022 2:24:46 PM	End	Qualification	Session	OO
July 6, 2022 2:24:46 PM	Start	Reporting	Session	None
July 6, 2022 2:41:59 PM	End	Reporting	Session	None
July 6, 2022 2:41:58 PM	Start	Configuration	Session	None
July 6, 2022 2:41:40 PM	End	Configuration	Session	None

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Date: July 7, 2022 11:27:53 AM
System ID: RYQ_E01136

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User Name: seltzeris_jungseop
Hostname: ASRTY097902

System ID: RYQ_E01136
Print Date: July 7, 2022 11:27:54 AM

ALS_RYQ_E01136 Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 6, 2022 2:41:40 PM	Start	Qualification	Session	OO
July 6, 2022 2:41:40 PM	Start	Configuration	Tune EI - 9877B SQ - Source: None EI - Extractor Filament 1 (Qualitative - No setpoints associated)	None
July 6, 2022 2:41:36 PM	End	Execution	Tune EI - 9877B SQ - Source: None EI - Extractor Filament 1 (Qualitative - No setpoints associated)	Run Count: 1
July 6, 2022 2:41:38 PM	Start	Execution	Tune EI - 9877B SQ - Source: None EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None
July 6, 2022 2:42:48 PM	End	Qualification	Session	OO
July 6, 2022 2:42:48 PM	Start	Reporting	Session	None
July 6, 2022 2:42:52 PM	End	Reporting	Session	None
July 6, 2022 2:50:50 PM	Start	Qualification	Session	OO
July 6, 2022 2:50:52 PM	Start	Execution	Tune EI - 9877B SQ - Source: None EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None
July 6, 2022 2:51:12 PM	End	Qualification	Session	OO
July 6, 2022 2:51:12 PM	Start	Reporting	Session	None
July 6, 2022 2:56:29 PM	End	Reporting	Session	None
July 6, 2022 2:56:29 PM	Start	Qualification	Session	OO
July 6, 2022 2:56:29 PM	Start	Execution	Tune EI - 9877B SQ - Source: None EI - Extractor Filament 2 (Qualitative - No setpoints associated)	None

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System ID: RYQ_E01136

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User Name: seltzeris_jungseop
Hostname: ASRTY097902

System ID: RYQ_E01136
Print Date: July 7, 2022 11:27:54 AM

ALS_RYQ_E01136 Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 6, 2022 2:56:49 PM	End	Execution	Tune EI - 9877B SQ - Source: None EI - Extractor Filament 2 (Qualitative - No setpoints associated)	Run Count: 1
July 6, 2022 2:56:46 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: <= 1200	None
July 6, 2022 2:21:22 PM	End	Qualification	Session	OO
July 6, 2022 2:21:22 PM	Start	Reporting	Session	None
July 6, 2022 2:25:04 PM	End	Reporting	Session	None
July 6, 2022 2:25:04 PM	Start	Qualification	Session	OO
July 6, 2022 2:25:04 PM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: <= 1200	None
July 6, 2022 4:08:40 PM	Audit	Analysis	Session	None
July 7, 2022 8:13:47 AM	Audit	Analysis	Session	None
July 7, 2022 8:13:49 AM	Audit	Analysis	Session	None
July 7, 2022 9:13:54 AM	Start	Qualification	Session	OO
July 7, 2022 9:13:54 AM	Start	Execution	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: <= 1200	None
July 7, 2022 9:58:06 AM	Audit	Data	Signal to Noise EI - Liquid Injection, Front SSL, SQ - Source: EI - Extractor using Filament 1 - L: <= 1200	Data file Path: D:\00000209\ALS\#01.D

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Date: July 7, 2022 11:27:53 AM
System ID: RYQ_E01136

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User Name: admin@_gmsapi
Hostname: ABR70W7902

System ID: RYO_EN0136
Print Date: July 7, 2022 11:27:55 AM

ALS_RYO_EN0136 Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 7, 2022 8:58:53 AM	End	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Run Count: 1
July 7, 2022 9:07:48 AM	Abort	TestUnlocked	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Deviation Met for Run Count: 1
July 7, 2022 10:01:46 AM	Start	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	None
July 7, 2022 10:30:09 AM	Abort	Data	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Data File Path: D:\00000220\FL_SH_F01.D
July 7, 2022 10:54:55 AM	End	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Run Count: 2
July 7, 2022 10:57:30 AM	Abort	TestUnlocked	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Deviation Met for Run Count: 2
July 7, 2022 10:57:30 AM	Start	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	None
July 7, 2022 10:57:44 AM	Abort	Data	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Data File Path: D:\00000220\FL_SH_F01.D

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Date: July 7, 2022 11:27:55 AM
System ID: RYO_EN0136

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User Name: admin@_gmsapi
Hostname: ABR70W7902

System ID: RYO_EN0136
Print Date: July 7, 2022 11:27:55 AM

ALS_RYO_EN0136 Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 7, 2022 10:08:18 AM	End	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Run Count: 3
July 7, 2022 10:10:28 AM	Abort	TestUnlocked	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Deviation Met for Run Count: 3
July 7, 2022 10:10:28 AM	Start	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	None
July 7, 2022 10:10:30 AM	Abort	Data	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Data File Path: D:\00000220\FL_SH_F01.D
July 7, 2022 10:14:50 AM	End	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Run Count: 4
July 7, 2022 10:16:04 AM	Abort	TestUnlocked	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Deviation Met for Run Count: 4
July 7, 2022 10:16:04 AM	Start	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	None
July 7, 2022 10:16:15 AM	Abort	Data	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Data File Path: D:\00000220\FL_SH_F01.D

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Date: July 7, 2022 11:27:55 AM
System ID: RYO_EN0136

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User Name: admin@_gmsapi
Hostname: ABR70W7902

System ID: RYO_EN0136
Print Date: July 7, 2022 11:27:55 AM

ALS_RYO_EN0136 Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 7, 2022 10:15:27 AM	End	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Run Count: 5
July 7, 2022 10:16:48 AM	Abort	TestUnlocked	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Deviation Met for Run Count: 5
July 7, 2022 10:16:48 AM	Start	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	None
July 7, 2022 10:17:35 AM	Abort	Data	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Data File Path: D:\00000220\FL_SH_F01.D
July 7, 2022 10:17:14 AM	End	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 1 - L1 => 1200	Run Count: 6
July 7, 2022 10:16:49 AM	End	Qualification	Session	OO
July 7, 2022 10:18:40 AM	Start	Reporting	Session	None
July 7, 2022 10:21:30 AM	End	Reporting	Session	None
July 7, 2022 10:21:10 AM	Start	Qualification	Session	OO
July 7, 2022 10:21:17 AM	Start	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 2 - L1 => 1200	None
July 7, 2022 10:26:49 AM	End	Qualification	Session	OO
July 7, 2022 10:28:48 AM	Start	Reporting	Session	None
July 7, 2022 10:37:28 AM	End	Reporting	Session	None

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Date: July 7, 2022 11:27:55 AM
System ID: RYO_EN0136

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User Name: admin@_gmsapi
Hostname: ABR70W7902

System ID: RYO_EN0136
Print Date: July 7, 2022 11:27:55 AM

ALS_RYO_EN0136 Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 7, 2022 10:27:38 AM	Start	Qualification	Session	OO
July 7, 2022 10:27:38 AM	Start	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 2 - L1 => 1200	None
July 7, 2022 11:04:48 AM	Abort	Data	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 2 - L1 => 1200	Data File Path: D:\00000220\FL_SH_F01.D
July 7, 2022 11:11:47 AM	Start	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 2 - L1 => 1200	None
July 7, 2022 11:15:13 AM	End	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 2 - L1 => 1200	Run Count: 1
July 7, 2022 11:14:29 AM	Abort	TestUnlocked	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 2 - L1 => 1200	Deviation Met for Run Count: 1
July 7, 2022 11:14:29 AM	Start	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 2 - L1 => 1200	None
July 7, 2022 11:14:47 AM	Abort	Data	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 2 - L1 => 1200	Data File Path: D:\00000220\FL_SH_F01.D
July 7, 2022 11:19:34 AM	End	Execution	Signal to Hubs E1 - Liquid Injection, Front SSL, QC - Source: E1 - Extractor using Filament 2 - L1 => 1200	Run Count: 2

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Date: July 7, 2022 11:27:55 AM
System ID: RYO_EN0136

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User Name: adu.haha_pwanapras
 Headline: ASRTOM002
 System ID: RYO_EN0138
 Print Date: July 7, 2022 11:27:56 AM

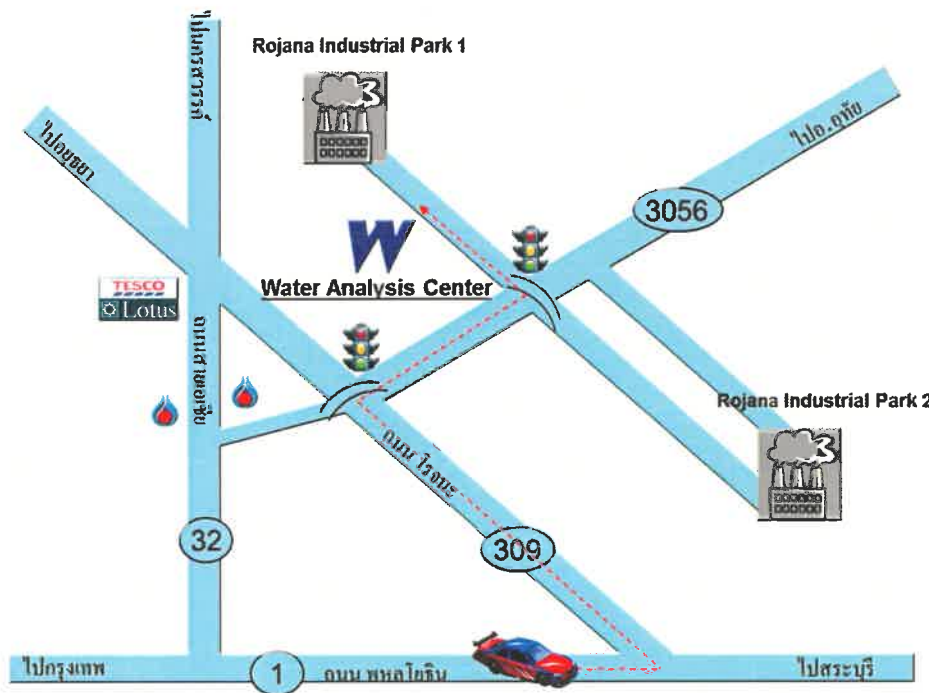
ALB_RYO_EN0138 Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
July 7, 2022 11:19:58 AM	Auth	Test Initiated	Signal to Histo EI - Liquid Injection, Front 68L, 80L - Source: EI - Extractor using Filament 2 - L: >= 1300	Deviation Path for Run Count : 2
July 7, 2022 11:19:58 AM	Start	Execution	Signal to Histo EI - Liquid Injection, Front 68L, 80L - Source: EI - Extractor using Filament 2 - L: >= 1300	None
July 7, 2022 11:20:13 AM	Auth	Data	Signal to Histo EI - Liquid Injection, Front 68L, 80L - Source: EI - Extractor using Filament 2 - L: >= 1300	Data Res Path : D:\GC\GC2\HOF\H_SAM_F001.D
July 7, 2022 11:21:52 AM	End	Execution	Signal to Histo EI - Liquid Injection, Front 68L, 80L - Source: EI - Extractor using Filament 2 - L: >= 1300	Run Count : 3
July 7, 2022 11:22:49 AM	End	Qualification	Signal to Histo EI - Liquid Injection, Front 68L, 80L - Source: EI - Extractor using Filament 2 - L: >= 1300	OK
July 7, 2022 11:22:49 AM	Stop	Reporting	Signal to Histo EI - Liquid Injection, Front 68L, 80L - Source: EI - Extractor using Filament 2 - L: >= 1300	None
July 7, 2022 11:23:46 AM	Auth	Reporting	Signal to Histo EI - Liquid Injection, Front 68L, 80L - Source: EI - Extractor using Filament 2 - L: >= 1300	Report Generated : Certificate

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 System ID: RYO_EN0138

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บริษัท ศูนย์วิเคราะห์น้ำ จำกัด
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