

ภาคผนวก ช

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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 Taledbangkhen, Khet Laksi, Bangkok 10210

Equipment: pH Meter  
Manufacturer: METTLER TOLEDO Model: SevenCompact S220  
Serial No.: B327527211 ID No.: WWL 0668  
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

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

(Dr. Ekachai Puttittwong)

Certificate No.: CO-1908005/22

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### 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	10-0804001/22	Apr. 7, 2023	THC
Digital Thermometer with Sensor	1523 / 5622	1709138 / 4605984-005	10-1006004/22	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	Nominal Value	UUC Reading		Uncertainty
(mV)	(pH)	pH	mV	(± 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)

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

Calibrated by: Kittipong

REV.02 02/24/21

Certificate No.: CO-1908005/22

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### Measurement Results (Cont.):

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

pH Standard Solution	Measured Value		Uncertainty
(pH)	(pH)	(mV)	(± pH)
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	10-1011001/21	Nov. 10, 2022	THC
Platinum Resistance Thermometer	5626	4854	C0A30047	Oct. 22, 2023	FLUKE
Liquid Bath	XORTS-40A	XO111019	10-0306002/21	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

FE-169

FE-169

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 Taladbangkhen, 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 ± 2) °C  
Relative Humidity: (50 ± 10) %  
Atmospheric Pressure: -

Calibration Location: Jayhawks 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

( ) (Krisyol K.) ( ) (Sakda Y.)  
( ) (Patiphan K.) ( ) (Onnape P.)  
( ) (Pongsak H.) ( ) (Nidiphong K.)  
( ) (Kanung C.) ( ) (Nonthachai K.)  
( ) (Pramong P.) ( ) (Noppol P.)

(Dr. Ekachai Puttittong)

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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 µS/cm	S211008031	Jan. 18, 2023	SCP Science
	1.421 mS/cm	S220112015	May 16, 2023	

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 (±)
151.1 µS/cm	150.9 µS/cm	0.2 µS/cm	1.5 µS/cm
1.421 mS/cm	1.423 mS/cm	-0.002 mS/cm	0.0052 mS/cm

Note: Adjustment points: 151.1µS/cm 1.421mS/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 -



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 °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 (mg/l) at 24.1°C	Before Adjust Indicator	Error	After Adjust Indicator	Error
Zero	0.00	+ 0.05	0.00	-
Span	8.25	- 1.12	8.25	-

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

Calibrated By

(Ms. Phanee Yooyen)  
Technician

**TEMPERATURE  
CONTROLLER ENCLOSURES**



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.

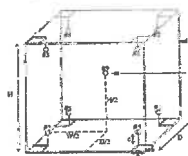
**1. Calibration Procedure:**

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

Figure 1 : Sensor Installation Location

Checked by : Thanagorn

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

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 Limchaicharoen  
(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.

[MCF-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

**Certificate of Calibration**

**TEMPERATURE  
CONTROLLER ENCLOSURES**



Certificate No.: MC 2203933

Page 1 of 3

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

Reference Job No. : 22-0740 Received Date : 24 March 2022  
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 2203933 ) 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 : ( 30.5 to 32.6 ) °C  
Relative Humidity : ( 56.2 to 61.2 ) %  
Date of Calibration : 24 March 2022 Date of Issue : 28 March 2022

Checked by : Thanagorn  
Thanagorn Limchaicharoen  
(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.

Checked by : Thanagorn

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

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



## 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.Kanham, 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.Krisada Thinhutoci)  
Authorized Signatory

Issued Date : 26/09/2022

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

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

Megafil Co.,Ltd.

MO-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 10.69 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)

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Certificate No. : M01075/22

### 2. Inflow velocity test.

Select method. : ☐ DIM ☒ Exhaust velocity. ☐ MPG'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%

Megafil Co.,Ltd.

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

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Certificate No. : M01075/22

### Leak location

Supply HEPA Filter

Back



Exhaust HEPA Filter

Back



Result Summary ☒ Pass ☐ Fail

Equipment used : Acrosol 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.

Megafil Co.,Ltd.

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**

1511/1 Site installation ไม่มีการตรวจสอบเนื่องจากตู้ไม่มีฟังก์ชันนี้

**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/m<sup>2</sup> when measures at work floor surface.

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

Remark :

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63/14-15, 67/36-36, Soi Petchkasem 7, 7/1, Petchkasem Rd,  
 Watthapra, Bangkokyai, Bangkok 10600 Thailand.  
 Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jirenetee.com


**CERTIFICATE OF CALIBRATION**

Certificate No: WG-01022022  
 Page 1 of 2 pages

Measurement Item	: Cup anemometer with data logger.		
Manufacturer	: Data logger: Novelynx : Cup anemometer: Novelynx		
Model/Type	: Data logger: 200-WB-2SL6 : Cup anemometer: WS-02P		
Serial Number	: Data logger: A5040 : Cup anemometer: K6-040		
ID No	: Data logger: - : Cup anemometer: -		
Customer	: Water Analysis Center Co., Ltd. : 94/1 Moo 6, Thanhen, Aji-thai, Ayutthaya 13210		
Test Conditions	: Wind tunnel cross test section area	900	cm <sup>2</sup>
	: Anemometer frontal area	100	cm <sup>2</sup>
	: Diameter of mounting pipe	-	mm
	: Blockage ratio of test object	0.111	(%)
Test Conditions	: Air temperature	26.3	±0.8 °C
	: Air pressure	1011.1	±0.4 hPa
	: Relative air humidity	55.6	±3.6 %RH
Calibration Procedure	Calibration was carried out base on: ISO 61400-12-1 Ed.1: 2005-Performance Measurements of Electricity Producing Wind Turbines MEASNET Anemometer Calibration Procedure - Version 2: 2009.		
Traceability	This calibration documents the traceable to national standard, which realize the unit of measurements according to the international system of units (SI) through National Institute of Metrology Thailand (NIMT).		
Measurement Date	: FEB 18, 2022.		
Issued Date	: FEB 21, 2022.		

Calibrated by  
☒ Mr. Sorach Thephad  
☐ Miss Orattana Wittayap



Approved Signatory:   
 Mr. Paitiya Booncharoen  
 Calibration Department Manager

**ภาคผนวก ค**

เอกสารสอบเทียบความถูกต้องของเครื่องมือ





63/14-15,67/35-36, Soi Petchkasem 7/1, Petchkasem Rd,  
Wattapra, Bangkokyai, Bangkok 10600 Thailand.  
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranetee.com

Continuation of Certificate of Calibration Number

Certificate No: WS-01022022  
Page 2 of 2 Pages

Result of calibration: ☒ Without adjustment ☐ With adjustment

Calibration in the range of 1 - 10 m/s at a calibration interval of 1 m/s

The results of calibration and associated measurement uncertainties are reported in the table below.

Ver. Reading m/s	Ver. Reading m/s	Error (m/s)	Uncertainty (%)
2.097	2.0	-0.1	2.4
4.135	4.1	0.0	1.7
6.04	6.0	0.0	1.1
8.03	8.1	0.1	0.71
10.00	10.0	0.0	1.1
11.97	12.1	0.1	0.91
13.97	13.9	-0.1	0.83
14.04	14.1	0.1	0.60
14.97	15.1	0.1	1.2
12.97	13.0	0.0	0.87
11.01	11.0	0.0	1.5
8.99	9.0	0.0	1.4
6.98	7.0	0.0	0.85
5.171	5.2	0.0	0.97
3.033	3.0	0.0	2.3
1.034	0.9	-0.1	4.5

UUC: Unit Under Calibration

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

Appendix 1: Instrumentation

NO	Sensor	Manufacturer	Model/Type	Calibration Date	Certificate Report Number	Range
1	Pilot static	TESTO INC.	04352143	Aug 07, 2021	HW-0034-21	6 - 30 m/s
2	Precision Differential Pressure Meter	Zoglab	DPM2500	Aug 07, 2021	HW-0034-21	5 - 50 m/s
3	Air velocity transducer (hot wire)	T&E INC.	8466-12	Aug 08, 2021	HW-0036-21	0 - 5 m/s
4	Temperature	Zoglab	DSR-TMP	March 30, 2021	DL-0027-21	-30 - 70°C
5	Relative humidity	Zoglab	DSR-TMP	March 30, 2021	RH-0303-2021	0 - 100 %RH
6	Atmospheric pressure	Zoglab	DSR-TMP	March 30, 2021	BP-0103-2021	600 - 1100 hPa
7	Wind tunnel	ESSOM	MP3300	-	-	0 - 50 Hz

\*\*\*End of Certificate of Calibration\*\*\*



JIRANETEE ASSOCIATES CO., LTD.



63/14-15,67/35-36, Soi Petchkasem 7/1, Petchkasem Rd,  
Wattapra, Bangkokyai, Bangkok 10600 Thailand.  
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranetee.com

## CERTIFICATE OF CALIBRATION

Certificate No: WD-01022022

Page 1 of 2 pages

Measurement Item : Wind direction sensor with data logger.

Manufacturer : Data logger: Novotek  
Wind direction sensor: Novotek

Model/Type : Data logger: 200-WS-26LB  
Wind direction sensor: WS-02P

Serial Number : Data logger: A5040  
Wind direction sensor: K5-D40

ID No : Data logger: -  
Wind direction sensor: -

Customer : Water Analysis Center Co., Ltd  
94/1 Moo 6, Thanburi, A-Uthai, Ayutthaya 13210

Environmental Condition:  
The measurement was carried out in an ambient temperature of (23±3) °C and relative humidity of (40±10) %.

### Measurement Method

The wind direction sensor calibration according to comparison method with reference angle measurement electronic theodolite and the laser is used for side control. The measurement were taken at 45° intervals in clockwise and counterclockwise directions.

Note: The UUC was warmed up for 1 hour prior to the calibration being performed

### Traceability:

The measurement results are traceable to the International system of units (SI) through Certificate No: Q21086014, Certificate No: HWS44/0025.

Measurement Date : FEB 18, 2022  
Issued Date : FEB 21, 2022

Performed by  
☒ Mr. Soravit Thachalad  
☐ Miss Orasit Whattakanya



Approved Signature: \_\_\_\_\_

Mr. Pichya Booncharoen,  
Calibration Department Manager

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



63/14-15,67/35-36, Soi Petchkasem 7/1, Petchkasem Rd,  
Wattapra, Bangkokyai, Bangkok 10600 Thailand.  
Tel: (66) 02-8680812#13 Fax: (66) 02-8680860 www.jiranetee.com

Continuation of Certificate of Calibration Number

Certificate No: WD-01022022  
Page 2 of 2 pages

Result of calibration: ☐ Without adjustment ☒ With adjustment

Calibration in the range of 0 - 360 ° at a calibration interval of 45°.

The results of calibration and associated measurement uncertainties are reported in table below.

NO	Turning Direction	Nominal Angle ()	Standard Reading ()	UUC* Reading ()	Error ()	Uncertainty ±()
1		0/360	360	359	-1	3.0
2		45	45	41	-4	3.0
3		90	90	87	-3	3.0
4		135	135	136	0	3.0
5		180	180	182	2	3.0
6		225	225	227	2	3.0
7		270	270	273	3	3.0
8		315	315	319	4	3.0
9		0/360	360	359	-1	3.0
10		45	45	41	-4	3.0
11		90	90	87	-3	3.0
12		135	135	136	0	3.0
13		180	180	182	2	3.0
14		225	225	227	2	3.0
15		270	270	273	3	3.0
16		315	315	319	4	3.0

UUC\*: Unit Under Calibration The reported expanded uncertainty is based on standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%

\*\*\*End of Certificate of Calibration\*\*\*



JIRANETEE ASSOCIATES CO., LTD.



RECALIBRATION

DUE DATE:

February 11, 2023

## Certificate of Calibration

### Calibration Certification Information

Cal. Date: February 11, 2022 Rootmeter S/N: 438320 Te: 294 °K  
Operator: Jim Tisch Pa: 742.70 mm Hg  
Calibration Model #: TE-5028A Calibrator S/N: 3271

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.2550	4.3	1.50
2	3	4	1	0.9780	7.1	2.50
3	5	6	1	0.8910	8.4	3.00
4	7	8	1	0.8260	9.9	3.50
5	9	10	1	0.6280	16.8	6.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Vstd}{Vstd} \right)}$ (y-axis)	Va (x-axis)	Qa (x-axis)	$\sqrt{\Delta H \left( \frac{Pa}{Pa} \right) \left( \frac{Ta}{Ta} \right)}$ (y-axis)
0.9848	0.7847	1.2189	0.9942	0.7922	0.7706
0.9811	1.0031	1.5736	0.9904	1.0127	0.9948
0.9793	1.0991	1.7238	0.9887	1.1096	1.0898
0.9773	1.1832	1.8619	0.9867	1.1945	1.1771
0.9681	1.5416	2.4379	0.9774	1.5583	1.5411
QSTD		m= 1.60965	QA		m= 1.00794
		b= -0.04335			b= -0.02740
		rw 0.99999			rw 0.99999

Calculations	
Vstd = ΔVol(Pa-ΔP/Pstd)(Tstd/Ta)	Va = ΔVol((Pa-ΔP)/Pa)
Qstd = Vstd/ΔTime	Qa = Va/ΔTime
For subsequent flow rate calculations:	
Qstd = 1/m $\left( \sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Vstd}{Vstd} \right)} \right) - b$	Qa = 1/m $\left( \sqrt{\Delta H \left( \frac{Pa}{Pa} \right) \left( \frac{Ta}{Ta} \right)} \right) - b$

Standard Conditions	
Tstd:	294.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	rootmeter 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.

ch Environmental, Inc.  
3 South Miami Avenue  
age of Cleves, OH 45002

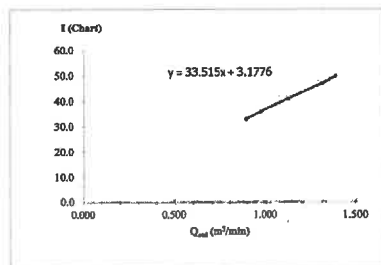
www.tisch-env.com  
TOLL FREE: (877)263-7510  
FAX: (513)467-9009



**High Volume Air Sampler Calibration Worksheet**

Project Site : สวนอุตสาหกรรมโรจนะอุตสาหกรรม Page 1 of 1  
 Location : บ้านนาหนาม  
 Date of measurement : 12/12/2022  
 Worksheet No. : C-121222-WWL0093 Calibration Office  
 High Volume ID : WWL0093 Calibrator ID : WWL0103  
 High Volume Model : TE-5170 (TSP) Calibrator Model : TE-5028A  
 High Volume S/N : 2729 Calibrator S/N : 3271  
 Ambient Condition : 11/02/2022  
 Temperature (°C) : 26 Quality Standard Slope : 1.59945  
 Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01874

Test No.	delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (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	

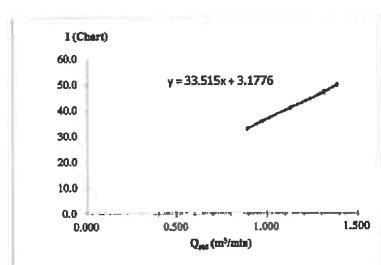


Calibrated by : Mr. RATTAPOL BAIKAI Approved by : Mr. RUNGSASIKORN KOSUM  
 Chemist Technical Management  
 POLAB 5.5-1/25 วันที่ใช้: 1 วันที่สอบ: 1 ส.ร. 2560 หน้า: 1 หน้า 1

**High Volume Air Sampler Calibration Worksheet**

Project Site : สวนอุตสาหกรรมโรจนะอุตสาหกรรม Page 1 of 1  
 Location : บ้านนาหนาม  
 Date of measurement : 12/12/2022  
 Worksheet No. : C-121222-WWL0094 Calibration Office  
 High Volume ID : WWL0094 Calibrator ID : WWL0103  
 High Volume Model : TE-5170 (TSP) Calibrator Model : TE-5028A  
 High Volume S/N : 2736 Calibrator S/N : 3271  
 Ambient Condition : 11/02/2022  
 Temperature (°C) : 26 Quality Standard Slope : 1.59945  
 Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01874

Test No.	delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (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	

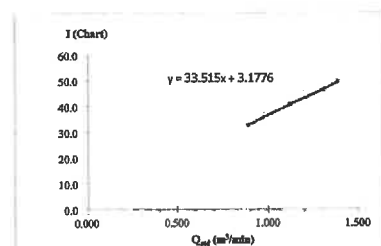


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 Chemist Technical Management  
 POLAB 5.5-1/25 วันที่ใช้: 1 วันที่สอบ: 1 ส.ร. 2560 หน้า: 1 หน้า 1

**High Volume Air Sampler Calibration Worksheet**

Project Site : สวนอุตสาหกรรมโรจนะอุตสาหกรรม Page 1 of 1  
 Location : บ้านนาหนาม  
 Date of measurement : 12/12/2022  
 Worksheet No. : C-121222-WWL0095 Calibration Office  
 High Volume ID : WWL0095 Calibrator ID : WWL0103  
 High Volume Model : TE-5170 (TSP) Calibrator Model : TE-5028A  
 High Volume S/N : 2727 Calibrator S/N : 3271  
 Ambient Condition : 11/02/2022  
 Temperature (°C) : 26 Quality Standard Slope : 1.59945  
 Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01874

Test No.	delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (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	

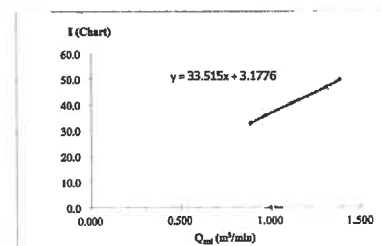


Calibrated by : Mr. RATTAPOL BAIKAI Approved by : Mr. RUNGSASIKORN KOSUM  
 Chemist Technical Management  
 POLAB 5.5-1/25 วันที่ใช้: 1 วันที่สอบ: 1 ส.ร. 2560 หน้า: 1 หน้า 1

**High Volume Air Sampler Calibration Worksheet**

Project Site : สวนอุตสาหกรรมโรจนะอุตสาหกรรม Page 1 of 1  
 Location : บ้านนาหนาม  
 Date of measurement : 12/12/2022  
 Worksheet No. : C-121222-WWL0096 Calibration Office  
 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 : 11/02/2022  
 Temperature (°C) : 26 Quality Standard Slope : 1.59945  
 Barometric Pressure (mmHg) : 756 Quality Standard Intercept : -0.01874

Test No.	delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (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	

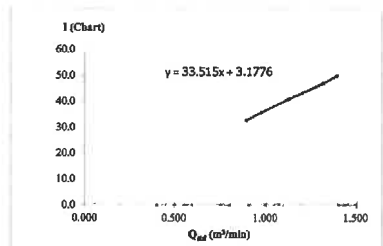


Calibrated by : Mr. RATTAPOL BAIKAI Approved by : Mr. RUNGSASIKORN KOSUM  
 Chemist Technical Management  
 POLAB 5.5-1/25 วันที่ใช้: 1 วันที่สอบ: 1 ส.ร. 2560 หน้า: 1 หน้า 1

**High Volume Air Sampler Calibration Worksheet**

Project Site : **สวนอุตสาหกรรมโรจนะอุบลราชธานี** Page 1 of 1  
 Location : **วัดโนนแดง**  
 Date of measurement : **12/12/2022**  
 Worksheet No. : **C-121222-WWL0097** Calibration Office : **WWL0103**  
 High Volume ID : **WWL0097** Calibrator ID : **TE-5028A**  
 High Volume Model : **TE-5170 (TSP)** Calibrator S/N : **3271**  
 High Volume S/N : **2726** Calibrator S/N : **3271**  
 Ambient Condition : **11/02/2022**  
 Temperature (°C) : **26** Quality Standard Slope : **1.99945**  
 Barometric Pressure (mmHg) : **756** Quality Standard Intercept : **-0.01874**

Test No.	delta H <sub>2</sub> O (inch)	Q <sub>ad</sub> (m³/min)	I (Chart)	IC (Corrected)	Linear Regression
1	4.50	1.390	50.0	49.80	Slope : 33.58 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	



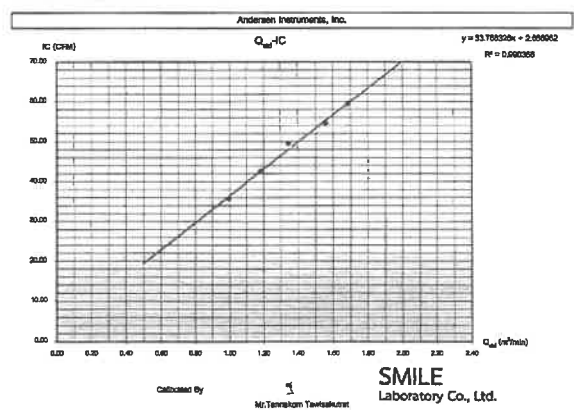
Calibrated by : **Mr. RATTAPOL BAIKAI**  
 Chemist

Approved by : **Mr. RUNGSASIKORN KOSUM**  
 Technical Manager  
 วันที่ : 12/12/2022 เวลา : 15.50 น. หน้า : 1 จาก 1

FO-LAB 1.5-1/23

**TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT**

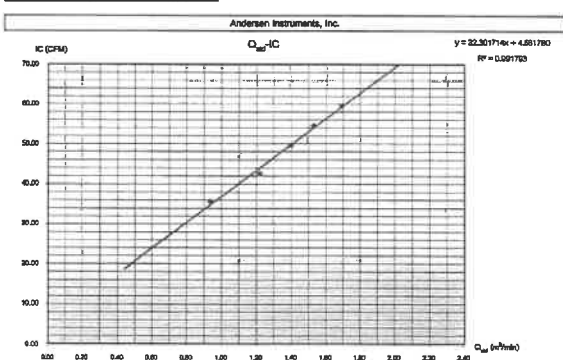
Site Information										
Sampler Location		วัดเขาสก (วัดเขาสก)			Date		13 December 2022			
Project Site		ถนนสุขุมวิท (วัดเขาสก)			Person		Mr. Tannakorn Tawakulrat			
Calibration Office					Calibrator					
Transfer Standard Type					Orifice		Q <sub>ad</sub> Slope (m)		2.10372	
Calibrator Model					TE-5028A		Q <sub>ad</sub> Intercept (b)		-0.03960	
Calibrator Serial Number					3032		Calibration Information			
Sampler Number		TSP No.01		Motor Serial Number		1203-415		Recorder Serial Number		528
Test										
Test No.	Pressure Drop Across Orifice (Δh <sub>2</sub> O) (inH <sub>2</sub> O)		(X)		(Y)		Temperature (°C = °C/273)		Barometric Pressure (mmHg)	
	Positive (Δh <sub>2</sub> O) (inH <sub>2</sub> O)		Q <sub>ad</sub> = (Δh <sub>2</sub> O) <sup>0.5</sup> (m³/min)		Sample Flow Rate (m³/min)		IC = Q <sub>ad</sub> × P <sub>ad</sub> × T <sub>ad</sub> × P <sub>ad</sub> <sup>-1</sup> × T <sub>ad</sub> <sup>-1</sup>			
	0.0000		0.0000		0.0000		0.0000			
1	2.2		2.1		4.30		2.05948		36.0	
2	3.2		3.0		6.10		2.46336		43.0	
3	4.1		3.8		7.90		2.78141		50.0	
4	5.4		5.3		10.70		3.24386		55.0	
5	6.3		6.2		12.50		3.50054		60.0	
							Average		32.0	
Linear Regression : y = ax + b										
Slope (m)	23.7953235									
Intercept (b)	2.8609952									
R-squared (R²)	0.982358									
Correlation Coefficient (r)	0.996198									



Calibrated By : **Mr. Tannakorn Tawakulrat**  
**SMILE Laboratory Co., Ltd.**

**TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT**

		Site Information							
Sampler Location		วันที่ เก็บข้อมูล : 13 ธันวาคม 2565		Date					
Project Site		สถานที่ เก็บข้อมูล		Person					
				Mr.Tannakorn Tawakulrat					
Calibration Office									
Transfer Standard Type		Orifice		Q <sub>ad</sub> Slope (m)					
Calibrator Model		TE-5028A		Q <sub>ad</sub> Intercept (b)					
Calibrator Serial Number		3032		2.10372					
				-0.03960					
Calibration Information									
Sampler Number		TSP No.04		Motor Serial Number					
				1203-432					
				Recorder Serial Number					
				522					
Test No.	Pressure Drop Across Orifice (Δh <sub>2</sub> O) (inH <sub>2</sub> O)		(A)	(X)	(Y)	Temperature (°C = °C/273)	Barometric Pressure (mmHg)		
	Positive (mmHg) Δh <sub>2</sub> O		$Q_{ad} = \frac{(\Delta h_{2O})^{0.5}}{(t/60min)}$		Sample Flow Rate (m <sup>3</sup> /min)				
					Indication (0.1 min)				
	1	1.9	1.9	3.80	1.83321	36.0	32.0	760.0	
	2	3.3	3.2	6.50	2.82038	43.0	42.84	760.0	
	3	4.4	4.2	8.80	2.90628	1.40094	50.0	49.59	760.0
	4	5.2	5.1	10.30	3.18277	1.59142	55.0	54.54	760.0
5	6.4	6.2	12.80	3.52024	1.80180	60.0	58.50	760.0	
Linear Regression : y= mx + b				Average			32.0	760.0	
R-Square (R <sup>2</sup> )		32.301714							
Intercept (b)		4.551700							
R-Square (R <sup>2</sup> )		0.951793							
Correlation Coefficient (r)		0.985639							

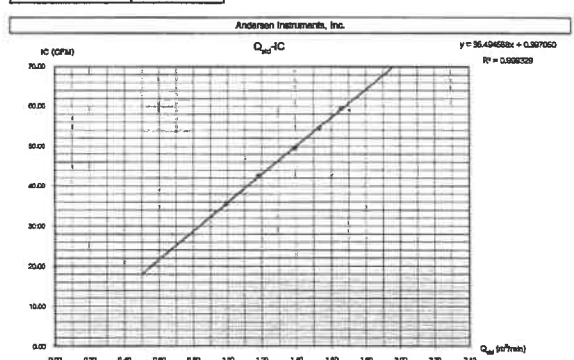


Calibrated By : **Mr. Tannakorn Tawakulrat**  
**SMILE Laboratory Co., Ltd.**

**TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT**

Site Information								
Sampler Location		Date	13 December 2022					
Project Site		Person	Mr. Tannakorn Tawakulrat					
Calibration Office								
Transfer Standard Type		Orifice	Q <sub>ad</sub> Slope (m)					
Calibrator Model		TE-0255A	Q <sub>ad</sub> Intercept (b)					
Calibrator Serial Number		3032	-0.03960					
Calibration Information								
Sampler Number		TSP No.05	Motor Serial Number					
			1203-422					
Recorder Serial Number		559						
Test No.	Pressure Drop Across Orifice (Δh <sub>2</sub> O) (inH <sub>2</sub> O)	(X)	(Y)	Temperature (°C = °C/273)	Barometric Pressure (mmHg)			
	Positive (mmHg) (Δh <sub>2</sub> O)	Q <sub>ad</sub> = (Δh <sub>2</sub> O) <sup>0.5</sup> (m³/min)	Sample Flow Rate (m³/min) Indication of (m³/min)	IC = Q <sub>ad</sub> × P <sub>ad</sub> × T <sub>ad</sub> <sup>-1</sup> × P <sub>ad</sub> <sup>-1</sup> (m³/min)				
1	2.2	2.1	4.30	2.05948	0.69003	36.0	32.0	760.0
2	3.1	3.0	6.10	2.46336	1.18279	43.0	42.84	760.0
3	4.5	4.2	8.80	2.89132	1.39386	50.0	49.59	760.0
4	5.2	5.1	10.30	3.18277	1.59142	55.0	54.54	760.0
5	6.1	6.0	12.10	3.44989	1.69209	60.0	58.50	760.0
				Average		32.0	760.0	760.0

Linear Regression: y = mx + b	
Slope (m)	35.494568
Intercept (b)	0.367055
R-Square (R²)	0.977329
Correlation Coefficient (r)	0.988684



Calibrated By : **Mr. Tannakorn Tawakulrat**  
**SMILE Laboratory Co., Ltd.**



บริษัท สไมล์ แล็บอราทอรี จำกัด  
Smile Laboratory Co., Ltd.  
363/1 Moo 5, Tambon Bang, Amphoe Bang, Nakhon Phanom 49100 Tel: 02-227-0887 Fax: 02-454-0217

# TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

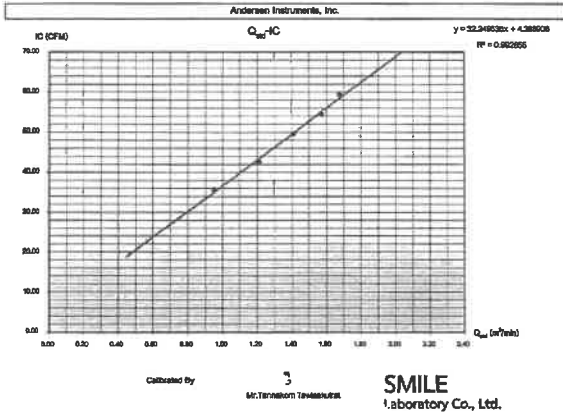
Site Information	
Sampler Location	วัดป่าสัก ตำบลบ้านกล้วย อำเภอเมือง จังหวัดสุพรรณบุรี
Date	19 December 2022
Project Site	บ้านกล้วย (Ban Kluay)
Person	Mr. Tansorn Tewakulrat

Calibration Orifice	
Transfer Standard Type	Orifice
Calibrator Model	TE-6070A
Calibrator Serial Number	3002
Orifice Slope (m)	2.10372
Orifice Intercept (b)	-0.00990

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

Test No.	Pressure Drop Across Orifice ( $\Delta h_{H_2O}$ ) (inH <sub>2</sub> O)	(A) $\Delta h_{H_2O}$ (mmH <sub>2</sub> O)	(X) $Q_{std} = (14.72/P_{std})^{0.5}$ (m <sup>3</sup> /min)	(Y) Sample Flow Rate Indication (l/min)	Temperature (°C) = (°F-32)/1.8	Barometric Pressure (mmHg)
1	2.0	1.9	3.80	1.90448	26.0	30.0
2	3.3	3.1	6.40	2.60093	26.0	30.0
3	4.4	4.3	8.70	2.82514	26.0	30.0
4	5.5	5.4	10.80	3.27410	26.0	30.0
5	6.3	6.1	12.40	3.40219	26.0	30.0
Average						

Linear Regression: $y = mx + b$	
Slope (m)	21.349038
Intercept (b)	-0.009900
R-Square (R <sup>2</sup> )	0.997955
Correlation Coefficient (r)	0.998971



บริษัท สไมล์ แล็บอราทอรี จำกัด  
Smile Laboratory Co., Ltd.  
363/1 Moo 5, Tambon Bang, Amphoe Bang, Nakhon Phanom 49100 Tel: 02-227-0887 Fax: 02-454-0217

# TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

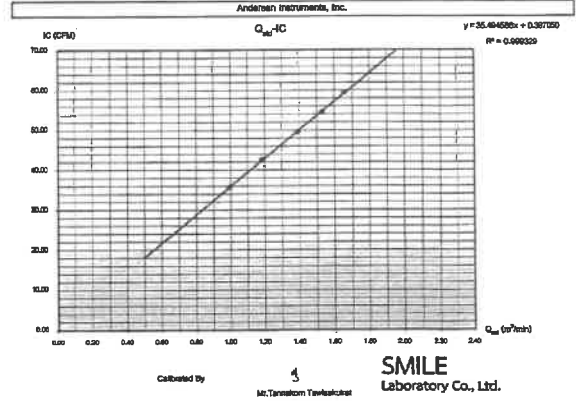
Site Information	
Sampler Location	วัดป่าสัก ตำบลบ้านกล้วย อำเภอเมือง จังหวัดสุพรรณบุรี
Date	19 December 2022
Project Site	บ้านกล้วย (Ban Kluay)
Person	Mr. Tansorn Tewakulrat

Calibration Orifice	
Transfer Standard Type	Orifice
Calibrator Model	TE-6070A
Calibrator Serial Number	3002
Orifice Slope (m)	2.10372
Orifice Intercept (b)	-0.00990

Calibration Information	
Sampler Number	TSP No.02
Motor Serial Number	1203-421
Recorder Serial Number	560

Test No.	Pressure Drop Across Orifice ( $\Delta h_{H_2O}$ ) (inH <sub>2</sub> O)	(A) $\Delta h_{H_2O}$ (mmH <sub>2</sub> O)	(X) $Q_{std} = (14.72/P_{std})^{0.5}$ (m <sup>3</sup> /min)	(Y) Sample Flow Rate Indication (l/min)	Temperature (°C) = (°F-32)/1.8	Barometric Pressure (mmHg)
1	2.2	2.1	4.30	2.06846	26.0	30.0
2	3.1	3.0	6.10	2.44998	26.0	30.0
3	4.2	4.0	8.30	2.80132	26.0	30.0
4	5.2	5.1	10.30	3.16279	26.0	30.0
5	6.1	6.0	12.10	3.40219	26.0	30.0
Average						

Linear Regression: $y = mx + b$	
Slope (m)	35.404663
Intercept (b)	0.307050
R-Square (R <sup>2</sup> )	0.998329
Correlation Coefficient (r)	0.999164

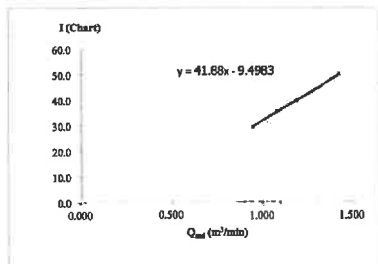


บริษัท ศูนย์วิเคราะห์น้ำ จำกัด  
WATER ANALYSIS CENTER COMPANY LIMITED  
194 หมู่ 5 ตำบลบ้านกล้วย อำเภอเมือง จังหวัดสุพรรณบุรี 32110  
194 Moo 5, Tambon Bang, Amphoe Bang, Nakhon Phanom 49100 Tel: 0-35226-583, 0-35800-593 Fax: 0-35800-594

## High Volume Air Sampler Calibration Worksheet

Project Site:	สถานีตรวจอากาศกรมอุตุนิยมวิทยา	Page 1 of 1
Location:	วัดป่าสัก	
Date of measurement:	12/12/2022	
Worksheet No.:	C-121222-WWL0098	Calibration Orifice
High Volume ID:	WWL0098	Calibrator ID:
High Volume Model:	TE-6070 (FM10)	Calibrator Model:
High Volume S/N:	2734	Calibrator S/N:
Ambient Condition		Calibrate Date:
Temperature (°C):	26	Quality Standard Slope:
Barometric Pressure (mmHg):	756	Quality Standard Intercept:

Test No.	delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /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	1.185	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  
Approved by: Mr. RUNOSASIKORN KOSUM  
Chemist Technical Manager

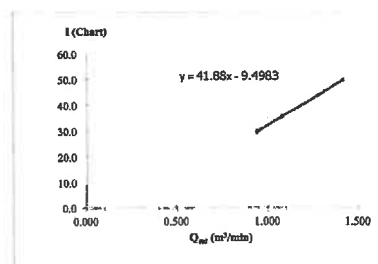


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WATER ANALYSIS CENTER COMPANY LIMITED  
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194 Moo 5, Tambon Bang, Amphoe Bang, Nakhon Phanom 49100 Tel: 0-35226-583, 0-35800-593 Fax: 0-35800-594

## High Volume Air Sampler Calibration Worksheet

Project Site:	สถานีตรวจอากาศกรมอุตุนิยมวิทยา	Page 1 of 1
Location:	วัดป่าสัก	
Date of measurement:	12/12/2022	
Worksheet No.:	C-121222-WWL0099	Calibration Orifice
High Volume ID:	WWL0099	Calibrator ID:
High Volume Model:	TE-6070 (FM10)	Calibrator Model:
High Volume S/N:	2732	Calibrator S/N:
Ambient Condition		Calibrate Date:
Temperature (°C):	26	Quality Standard Slope:
Barometric Pressure (mmHg):	756	Quality Standard Intercept:

Test No.	delta H <sub>2</sub> O (inch)	Q <sub>std</sub> (m <sup>3</sup> /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	1.185	40.0	25.15	
4	2.90	1.081	36.0	22.64	
5	2.20	0.943	30.0	18.87	

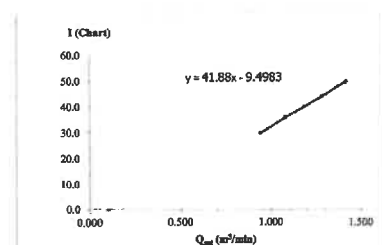


Calibrated by: Mr. RATTAPOL BAIKAI  
Approved by: Mr. RUNOSASIKORN KOSUM  
Chemist Technical Manager

## High Volume Air Sampler Calibration Worksheet

Project Site :	สถานศึกษากรมราชทัณฑ์		Page 1 of 1
Location :	กรุงเทพมหานคร		
Date of measurement :	12/12/2022		
Worksheet No. :	C-121232-WWL6108	Calibration Office	
High Volume ID :	WWL0100	Calibrator ID :	WWL0103
High Volume Model :	TE-6070 (PM10)	Calibrator Model :	TE-5028A
High Volume S/N :	2735	Calibrator S/N :	3271
Ambient Condition		Calibrate Date :	11/02/2022
Temperature (°C) :	26	Quality Standard Slope :	3.00155
Barometric Pressure (mmHg) :	756	Quality Standard Intercept :	-0.01185

Test No.	delta H <sub>2</sub> O (inch)	Q <sub>ad</sub> (m <sup>3</sup> /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	2.70	0.943	30.0	18.87	



Calibrated by :

Mr. RATTAPOL BAIKAI

Approved by :

Mr. RUNGSASIKORN KOSUM

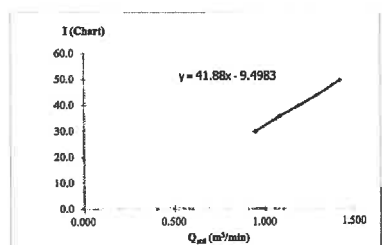
POLAR 5.5-125

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

## High Volume Air Sampler Calibration Worksheet

Project Site : **สวนสาธารณะโรงเรียนสุรดา** Page 1 of 1  
 Location : **สำนักงานโครงการ**  
 Date of measurement : **12/12/2022**  
 Worksheet No. : **C-131222-WWLJ01** Calibration Office : **WWL0103**  
 High Volume ID : **WWL0101** Calibrator ID : **TE-5028A**  
 High Volume Model : **TE-6070 (PM10)** Calibrator Model : **3271**  
 High Volume S/N : **2733** Calibrator S/N : **1102/2022**  
 Ambient Condition : **26** Calibrate Date : **1,00155**  
 Temperature (°C) : **756** Calibrate Date : **0,01185**  
 Barometric Pressure (mmHg) : **26** Quality Standard Slope : **1,00155**  
 Barometric Pressure (mmHg) : **756** Quality Standard Intercept : **0,01185**

Test No.	delta H <sub>2</sub> O (inch)	Q <sub>ad</sub> (m <sup>3</sup> /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 BAIKAL  
Chemist

Approved by :

Mr. RUNGSASIKORN KOSUM

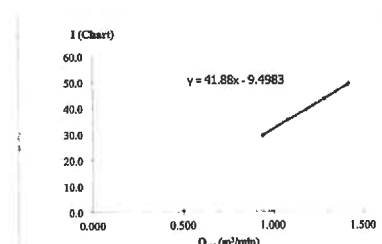
POLAB 55-1/25

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

## High Volume Air Sampler Calibration Worksheet

Project Site :	สวนสุขภาพตำบลบ้านหนองทราย		Page 1 of 1
Location :	บ้านโนนสูง		
Date of measurement :	12/12/2022		
Worksheet No. :	C-112123-WWL0102	Calibration Office	
High Volume ID :	WWL0102	Calibrator ID :	WWL0103
High Volume Model :	TE-670 (PM10)	Calibrator Model :	TS-5028A
High Volume S/N :	2731	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.	$\Delta H_f D$ (inch)	$Q_{st}$ ( $m^2/min$ )	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	2.70	0.963	30.0	18.87	



Calibrated by :

Mr. RATTAPOL BAIKAI  
Chemist

Approved by \_\_\_\_\_

Mr. RUNGSAKORN KOSUM

POLAR 5.5-12.5

Technical Management  
หน้าปกซ้าย : 1 หน้าปกขวา : 1 ค.ศ. 2560 หน้า : 1984

## PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

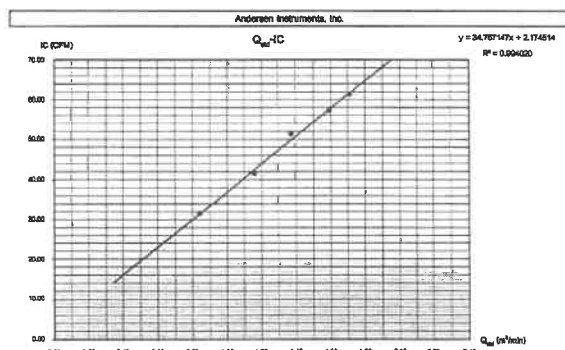
Site Information			
Sample Location	พื้นที่การปนเปื้อนที่ 1	Date	13 December 2022
Project Site	โรงงานปูนซีเมนต์	Person	Mr. Tanasorn Tanasakulrat
Calibration Office			
Transfer Standard Type	Orifice	$Q_{95}$ Slope (m)	2.10372
Calibration Model	TE-6325A	$Q_{95}$ Intercept (l)	-0.00900
Calibrator Serial Number	3352		

Calibration Information				
Calibration Date	Calibration Method	Calibration Standard	Calibration Result	Calibration Status
2023-10-26	Standard Method	Standard A	10.5	Pass
2023-10-26	Standard Method	Standard B	10.5	Pass
2023-10-26	Standard Method	Standard C	10.5	Pass
2023-10-26	Standard Method	Standard D	10.5	Pass
2023-10-26	Standard Method	Standard E	10.5	Pass
2023-10-26	Standard Method	Standard F	10.5	Pass
2023-10-26	Standard Method	Standard G	10.5	Pass
2023-10-26	Standard Method	Standard H	10.5	Pass
2023-10-26	Standard Method	Standard I	10.5	Pass
2023-10-26	Standard Method	Standard J	10.5	Pass
2023-10-26	Standard Method	Standard K	10.5	Pass
2023-10-26	Standard Method	Standard L	10.5	Pass
2023-10-26	Standard Method	Standard M	10.5	Pass
2023-10-26	Standard Method	Standard N	10.5	Pass
2023-10-26	Standard Method	Standard O	10.5	Pass
2023-10-26	Standard Method	Standard P	10.5	Pass
2023-10-26	Standard Method	Standard Q	10.5	Pass
2023-10-26	Standard Method	Standard R	10.5	Pass
2023-10-26	Standard Method	Standard S	10.5	Pass
2023-10-26	Standard Method	Standard T	10.5	Pass
2023-10-26	Standard Method	Standard U	10.5	Pass
2023-10-26	Standard Method	Standard V	10.5	Pass
2023-10-26	Standard Method	Standard W	10.5	Pass
2023-10-26	Standard Method	Standard X	10.5	Pass
2023-10-26	Standard Method	Standard Y	10.5	Pass
2023-10-26	Standard Method	Standard Z	10.5	Pass

	Pressure Drop Across Orifice ( $\Delta P_{or}$ )	(X)	(Y)	Temperature	Barometric Pressure
Test No.	Orifice ( $\Delta P_{or}$ )	$Q_{or} = (29.9)(\Delta P_{or})^{0.5}$	Specific Flow Rate Inches ( $\Delta P_{or}$ )	$Q = (29.9)(\Delta P_{or})^{0.5}$	(% $\pm$ (22.9))
1	1.8	1.5	3.0	32.4	305.0
2	3.0	1.6	3.0	42.5	305.0
3	4.2	1.8	3.0	52.6	305.0
4	5.7	1.9	3.0	62.7	305.0
5	6.8	2.0	3.0	72.8	305.0

Linear Regression :  $y = aX + b$

Slope (m)	34.767547
Intercept (b)	2.174814
R-Square (R <sup>2</sup> )	0.894020
Correlation Coefficient (r)	0.947008



Calibrated By

4  
Mr. Teerakorn Teerakulchai

**SMILE**  
Laboratory Co., Ltd.



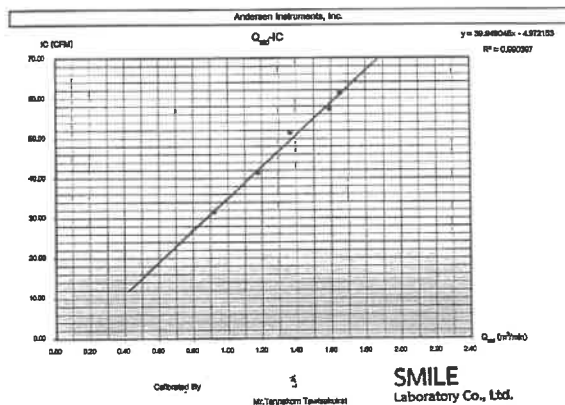
บริษัท สไมล์ แล็บอเรทอรี จำกัด  
Smile Laboratory Co., Ltd.  
563/1 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10140 โทรศัพท์ 02-227-0285 โทรสาร 02-454-0317  
563/1 Thani Thad Rd., Bangum, Phrakharu, Bangkok 10140 Tel. 02-227-0285 Fax. 02-454-0317

# PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information			
Sampler Location	บริเวณ กรุงเทพมหานคร	Date	13 December 2022
Project Site	ถนนพหลโยธิน	Person	Mr. Tarnatam Tamsakulrat
Calibration Office			
Transfer Standard Type	Office	Q <sub>sm</sub> Slope (m)	2.10372
Calibrator Model	TE-6025A	Q <sub>sm</sub> Intercept (b)	-0.09960
Calibrator Serial Number	3062		
Calibration Information			
Sampler Number	PM10 No.04	Motor Serial Number	1203-453
		Recorder Serial Number	610

Test No.	Pressure Drop Across Orifice (ΔP <sub>o</sub> ) (inH <sub>2</sub> O)	(A)	(X)	(I)	(Y)	Temperature (°C = °F/1.8)	Barometric Pressure (mmHg)
	Positive	mmHg	Q <sub>sm</sub> = (1/ΔP(A+b))	Sample Flow Rate (m³/min)	IC = (Q <sub>sm</sub> P <sub>sm</sub> T <sub>sm</sub> / T <sub>o</sub> ) <sup>1.04</sup>		
1	1.9	1.5	3.70	1.9034	0.92229	32.0	31.63
2	3.1	3.0	6.10	2.44131	1.17866	42.0	41.52
3	4.2	4.0	8.20	2.83061	1.36367	62.0	61.40
4	5.7	5.5	11.20	3.30801	1.60065	68.0	67.33
5	5.1	6.0	12.10	3.45638	1.65381	62.0	61.26
Average							305.0

Linear Regression: y = mx + b	
Slope (m)	36.940045
Intercept (b)	4.972153
R-Square (R²)	0.990367
Correlation Coefficient (r)	0.995187



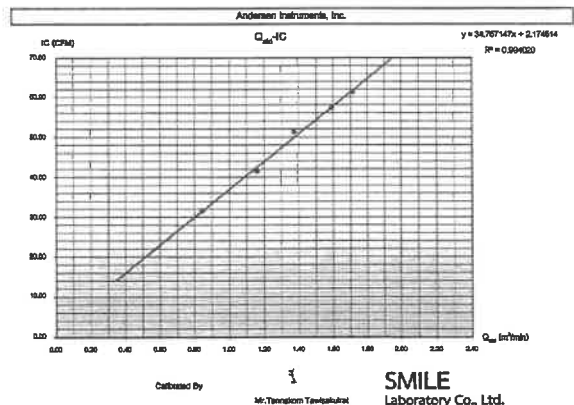
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Smile Laboratory Co., Ltd.  
563/1 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10140 โทรศัพท์ 02-227-0285 โทรสาร 02-454-0317  
563/1 Thani Thad Rd., Bangum, Phrakharu, Bangkok 10140 Tel. 02-227-0285 Fax. 02-454-0317

# PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information			
Sampler Location	บริเวณ กรุงเทพมหานคร	Date	13 December 2022
Project Site	ถนนพหลโยธิน	Person	Mr. Tarnatam Tamsakulrat
Calibration Office			
Transfer Standard Type	Office	Q <sub>sm</sub> Slope (m)	2.16872
Calibrator Model	TE-6025A	Q <sub>sm</sub> Intercept (b)	-0.09960
Calibrator Serial Number	3062		
Calibration Information			
Sampler Number	PM10 No.05	Motor Serial Number	1203-447
		Recorder Serial Number	605

Test No.	Pressure Drop Across Orifice (ΔP <sub>o</sub> ) (inH <sub>2</sub> O)	(A)	(X)	(I)	(Y)	Temperature (°C = °F/1.8)	Barometric Pressure (mmHg)
	Positive	mmHg	Q <sub>sm</sub> = (1/ΔP(A+b))	Sample Flow Rate (m³/min)	IC = (Q <sub>sm</sub> P <sub>sm</sub> T <sub>sm</sub> / T <sub>o</sub> ) <sup>1.04</sup>		
1	1.5	1.5	3.10	1.74036	0.84577	32.0	31.63
2	3.0	2.9	6.00	2.40006	1.15576	42.0	41.52
3	4.2	4.1	8.30	2.84772	1.37215	62.0	61.40
4	5.7	5.6	11.20	3.30801	1.60065	68.0	67.33
5	5.9	6.4	13.00	3.56384	1.71260	62.0	61.26
Average							305.0

Linear Regression: y = mx + b	
Slope (m)	34.767147
Intercept (b)	2.174514
R-Square (R²)	0.994030
Correlation Coefficient (r)	0.997008



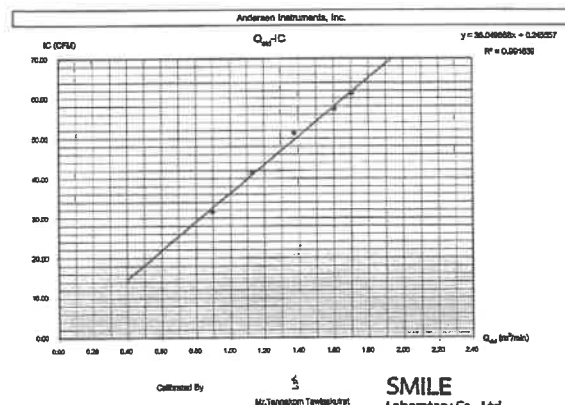
บริษัท สไมล์ แล็บอเรทอรี จำกัด  
Smile Laboratory Co., Ltd.  
563/1 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10140 โทรศัพท์ 02-227-0285 โทรสาร 02-454-0317  
563/1 Thani Thad Rd., Bangum, Phrakharu, Bangkok 10140 Tel. 02-227-0285 Fax. 02-454-0317

# PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information			
Sampler Location	บริเวณ กรุงเทพมหานคร	Date	13 December 2022
Project Site	ถนนพหลโยธิน	Person	Mr. Tarnatam Tamsakulrat
Calibration Office			
Transfer Standard Type	Office	Q <sub>sm</sub> Slope (m)	2.10372
Calibrator Model	TE-6025A	Q <sub>sm</sub> Intercept (b)	-0.09960
Calibrator Serial Number	3062		
Calibration Information			
Sampler Number	PM10 No.03	Motor Serial Number	1203-442
		Recorder Serial Number	606

Test No.	Pressure Drop Across Orifice (ΔP <sub>o</sub> ) (inH <sub>2</sub> O)	(A)	(X)	(I)	(Y)	Temperature (°C = °F/1.8)	Barometric Pressure (mmHg)
	Positive	mmHg	Q <sub>sm</sub> = (1/ΔP(A+b))	Sample Flow Rate (m³/min)	IC = (Q <sub>sm</sub> P <sub>sm</sub> T <sub>sm</sub> / T <sub>o</sub> ) <sup>1.04</sup>		
1	1.8	1.7	3.60	1.84634	0.86782	32.0	31.63
2	2.9	2.7	6.00	2.33812	1.13038	42.0	41.52
3	4.2	4.1	8.30	2.84772	1.37215	62.0	61.40
4	5.6	5.6	11.40	3.33742	1.60493	68.0	67.33
5	5.5	6.4	12.80	3.60200	1.70007	62.0	61.26
Average							305.0

Linear Regression: y = mx + b	
Slope (m)	35.043008
Intercept (b)	0.345567
R-Square (R²)	0.994638
Correlation Coefficient (r)	0.996211



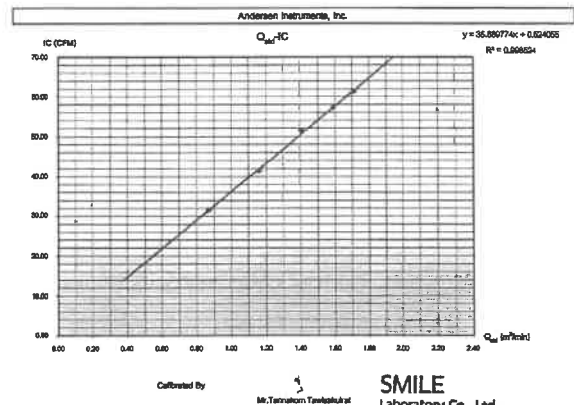
บริษัท สไมล์ แล็บอเรทอรี จำกัด  
Smile Laboratory Co., Ltd.  
563/1 ถนนพหลโยธิน แขวงจตุจักร เขตจตุจักร กรุงเทพฯ 10140 โทรศัพท์ 02-227-0285 โทรสาร 02-454-0317  
563/1 Thani Thad Rd., Bangum, Phrakharu, Bangkok 10140 Tel. 02-227-0285 Fax. 02-454-0317

# PM10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Site Information			
Sampler Location	บริเวณ กรุงเทพมหานคร	Date	13 December 2022
Project Site	ถนนพหลโยธิน	Person	Mr. Tarnatam Tamsakulrat
Calibration Office			
Transfer Standard Type	Office	Q <sub>sm</sub> Slope (m)	2.10372
Calibrator Model	TE-6025A	Q <sub>sm</sub> Intercept (b)	-0.09960
Calibrator Serial Number	3062		
Calibration Information			
Sampler Number	PM10 No.02	Motor Serial Number	1203-444
		Recorder Serial Number	600

Test No.	Pressure Drop Across Orifice (ΔP <sub>o</sub> ) (inH <sub>2</sub> O)	(A)	(X)	(I)	(Y)	Temperature (°C = °F/1.8)	Barometric Pressure (mmHg)
	Positive	mmHg	Q <sub>sm</sub> = (1/ΔP(A+b))	Sample Flow Rate (m³/min)	IC = (Q <sub>sm</sub> P <sub>sm</sub> T <sub>sm</sub> / T <sub>o</sub> ) <sup>1.04</sup>		
1	1.7	1.6	3.30	1.78862	0.87204	32.0	31.63
2	3.0	2.9	6.00	2.40006	1.15576	42.0	41.52
3	4.4	4.3	8.70	2.81883	1.40438	62.0	61.40
4	5.7	5.6	11.20	3.30801	1.60065	68.0	67.33
5	5.9	6.4	13.00	3.56384	1.71260	62.0	61.26
Average							305.0

Linear Regression: y = mx + b	
Slope (m)	35.886714
Intercept (b)	0.254266
R-Square (R²)	0.994034
Correlation Coefficient (r)	0.996992





ENVIR SERVICE  
42 Ramintra 14 year 9, Tha Raeng, Bangkhen, Bangkok 10230  
Tel : 02-9435814-5 Fax : 02-9438201 Tax id : 010555170865

### REPORT QA. GAS-CALIBRATOR

CALIBRATE DATE: 18 Dec 21

#### GAS CALIBRATOR

MANUFACTURER : Enviro-nics 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	997.00	2022.00	3085.00	3994.00	5000.00	5995.00	6990.00	7994.00	9004.00	9871.00	
(CCM)	%ERROR	-0.300	0.100	0.167	-0.150	0.000	-0.083	-0.143	-0.075	0.044	-1.290	-0.17

GAS	SETTING	10	20	30	40	50	60	70	80	90	100	AVG
FLOW	REF	10.18	20.19	30.27	40.16	50.34	60.33	70.54	80.69	90.28	100.7	
(CCM)	%ERROR	1.800	0.950	0.900	0.400	0.680	0.550	-0.771	0.862	0.311	0.700	0.79

#### 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	0.164	0.102	2.000	pass
0.200	0.211	0.202	1.000	pass
0.300	0.242	0.298	-0.667	pass
0.400	0.377	0.397	-0.750	pass

TEMPERATURE : 26.5 DEG.C

PRESSURE : 752 mmHg



TESTED BY :

Mr. Pasagon Samol



ENVIR SERVICE  
42 Ramintra 14 year 9, Tha Raeng, Bangkhen, Bangkok 10230  
Tel : 02-9435814-5 Fax : 02-9438201 Tax id : 010555170865

#### 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	0.020	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	0.286	0.298	-0.667	pass
0.400	0.388	0.396	-1.000	pass

TEMPERATURE : 26.5 DEG.C

PRESSURE : 752 mmHg



TESTED BY :

Mr. Pasagon Samol



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194 Moo 5, T.Bangna, A.Bangna, Bangkok 10210, Thailand  
Tel: 0-3228-343, 0-3280-993 Fax: 0-3280-994

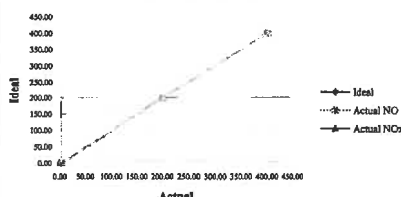
#### Nitrogen Dioxide Analyzer Calibration Worksheet

Project Site : งานอุตสาหกรรมโรงงาน  
Location : ใต้ถนน  
Date of measurement : 13 December 2022  
Worksheet No. : C-131222-WWL 0114  
Ambient NOx Analyzer ID : WWL 0114  
Manufacturer : HORIBA  
Ambient NOx Analyzer Model : APNA-370  
Ambient NOx Analyzer S/N : P1E3995

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 <sub>2</sub>	Error NO <sub>2</sub>	%Error NO <sub>2</sub>
ZERO	0.00	0.20	0.20	-	0.20	0.20	-
SPAN 200 ppb	200.00	200.10	0.10	0.05	200.20	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

#### Calibration Curve



Calibrated by : Suttiwat Jaitheerapapkul  
(Mr. SUTTIWAT JAITHIEERAPAPKUL)  
Chemist

Approved by : (Mr. RUNGSAKORN KOSUM)  
Technical Management



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194 Moo 5, T.Bangna, A.Bangna, Bangkok 10210, Thailand  
Tel: 0-3228-343, 0-3280-993 Fax: 0-3280-994

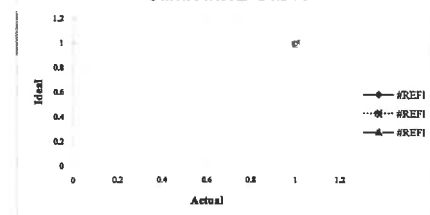
#### Nitrogen Dioxide Analyzer Calibration Worksheet

Project Site : งานอุตสาหกรรมโรงงาน  
Location : ใต้ถนน  
Date of measurement : 13 December 2022  
Worksheet No. : C-131222-WWL 0115  
Ambient NOx Analyzer ID : WWL 0115  
Manufacturer : HORIBA  
Ambient NOx Analyzer Model : APNA-370  
Ambient NOx Analyzer S/N : 705KA91J

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 <sub>2</sub>	Error NO <sub>2</sub>	%Error NO <sub>2</sub>
ZERO	0.00	0.10	0.10	-	0.20	0.20	-
SPAN 200 ppb	200.00	200.20	0.20	0.10	200.10	0.10	0.05
SPAN 400 ppb	400.00	400.20	0.20	0.05	400.20	0.20	0.05
AVERAGE (%)				0.07			0.05

#### Calibration Curve



Calibrated by : Suttiwat Jaitheerapapkul  
(Mr. SUTTIWAT JAITHIEERAPAPKUL)  
Chemist

Approved by : (Mr. RUNGSAKORN KOSUM)  
Technical Management





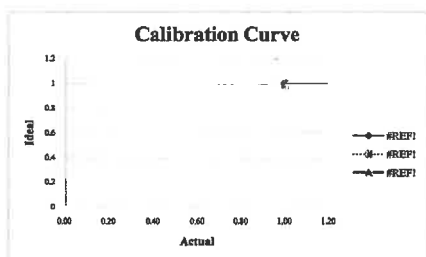
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194 Moo 5, T.Samwajuan, A.Sukothai, Ayutthaya 12110, Thailand  
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-594

### Nitrogen Dioxide Analyzer Calibration Worksheet

Project Site : กรมชลประทานโครงการชลประทาน  
Location : บ้านหนองปรือ  
Date of measurement : 13 December 2022  
Worksheet No. : C-131222-WWL 0116  
Ambient NOx Analyzer ID : WWL 0116  
Manufacturer : HORIBA  
Ambient NOx Analyzer Model : APNA-370  
Ambient NOx Analyzer S/N : 9BRKGTUK

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 <sub>x</sub>	Error NO <sub>x</sub>	%Error NO <sub>x</sub>
ZERO	0.00	0.10	0.10	-	0.20	0.20	-
SPAN 200 ppb	200.00	200.20	0.20	0.10	200.10	0.10	0.05
SPAN 400 ppb	400.00	400.20	0.20	0.05	400.20	0.20	0.05
AVERAGE (%)				0.07			0.05



Calibrated by : *Sutit*  
(Mr. SUTIWAT JAITHEERAPAPKUL)  
Chemist

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



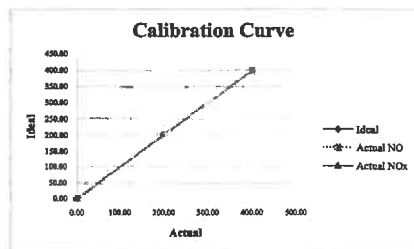
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194 Moo 5, T.Samwajuan, A.Sukothai, Ayutthaya 12110, Thailand  
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-594

### Nitrogen Dioxide Analyzer Calibration Worksheet

Project Site : กรมชลประทานโครงการชลประทาน  
Location : บ้านหนองปรือ  
Date of measurement : 13 December 2022  
Worksheet No. : C-131222-WWL 0117  
Ambient NOx Analyzer ID : WWL 0117  
Manufacturer : HORIBA  
Ambient NOx Analyzer Model : APNA-370  
Ambient NOx Analyzer S/N : VKLYC3K0

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 <sub>x</sub>	Error NO <sub>x</sub>	%Error NO <sub>x</sub>
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 : *Sutit*  
(Mr. SUTIWAT JAITHEERAPAPKUL)  
Chemist

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



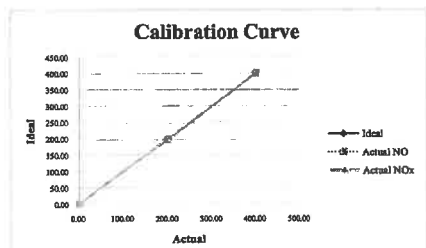
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194 Moo 5, T.Samwajuan, A.Sukothai, Ayutthaya 12110, Thailand  
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-594

### Nitrogen Dioxide Analyzer Calibration Worksheet

Project Site : กรมชลประทานโครงการชลประทาน  
Location : บ้านหนองปรือ  
Date of measurement : 13 December 2022  
Worksheet No. : C-131222-WWL 0118  
Ambient NOx Analyzer ID : WWL 0118  
Manufacturer : HORIBA  
Ambient NOx Analyzer Model : APSA-370  
Ambient NOx 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 NO	Error NO	%Error NO	Actual NO <sub>x</sub>	Error NO <sub>x</sub>	%Error NO <sub>x</sub>
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 : *Sutit*  
(Mr. SUTIWAT JAITHEERAPAPKUL)  
Chemist

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



### บริษัท เอ็นไอพี เซอร์วิส จำกัด

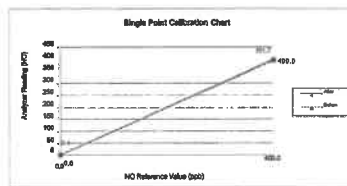
42 ถนนสุขุมวิท 14 แขวง 9 เขตวัฒนา กรุงเทพมหานคร 10110 โทรศัพท์ 02-9435814-5 โทรสาร 02-9435810  
42 Rasduburi 14-yak 9, The Rang, Bangkok, Bangkok 10230 Tel: 02-9435814-5 Fax: 02-9435810

### Analyzer Performance Test

Calibrated Date: 13 December 2022 (Penultimate Validity)

Instrument Information		Manufacturer Horiba Environmental	
Analyzer Type: NONOX/NOx Analyzer	Model: APNA-300	S/N: 8517870111	
Calibration System		Standard Gas	
Calibrator Unit	Analyzer Model: Chemi Hi - nit NOX	NO Conc: 15.22 PPM	
S/N: 700		NO Conc: 55.11 PPM	
ZERO AIR Generator API Model 701		CO Conc: 4.536 PPM	
S/N: 1054		Cylinder Number: 230120007	
		Expiry Date: 29 Oct. 2027	
Environment: Temperature: 25.8 °C		Humidity: 61 %RH	

Calibration Check (Before adjust)						
GAS	Reading Value (ppb)	Expected Value (ppb)	D/R%	Reading Value (ppb)	Expected Value (ppb)	D/R%
NO	0.1	0.0	0.1	395.2	400.0	-1.2
NOx	0.1	0.0	0.1	400.0	400.0	0.0
Calibration Check (After adjust)						
GAS	Reading Value (ppb)	Expected Value (ppb)	D/R%	Reading Value (ppb)	Expected Value (ppb)	D/R%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NOx	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By : Mr. Pasagorn Benoit



### บริษัท เอ็นวีเอ เซอร์วิส จำกัด

42 ถนนมิตรภาพ 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
42 Ramkham 14 year 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 13 December 2022 (วันเสาร์)

#### Instruments Information

Analyzer Type: NONOX/NOx Analyzer Model: 200A	Manufacturer: Thermo Environmental S/N: 605
--	--

#### Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Desh Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1024	NO Conc: 55.47 PPM SO <sub>2</sub> Conc: 55.11 PPM CO Conc: 4.535 PPM Cylinder number: E30125027 Expiry Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

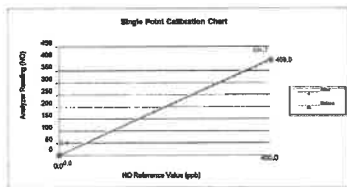
Humidity 51 %RH

#### Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	394.7	400.0	-1.3
NOx	0.1	0.0	0.1	400.0	400.0	0.0

#### Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NOx	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By: Mr. Pasagorn Samol



### บริษัท เอ็นวีเอ เซอร์วิส จำกัด

42 ถนนมิตรภาพ 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
42 Ramkham 14 year 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 13 December 2022 (วันเสาร์)

#### Instruments Information

Analyzer Type: NONOX/NOx Analyzer Model: 42C	Manufacturer: Thermo Environmental S/N: 42C-70204-356
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#### Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Desh Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1024	NO Conc: 48.05 ppm SO <sub>2</sub> Conc: 48.01 ppm CO Conc: 4.487 ppm Expiry Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

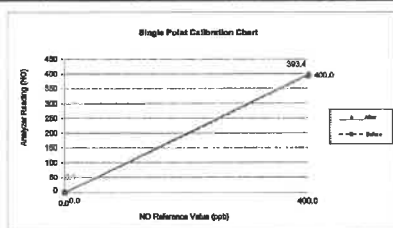
Humidity 51 %RH

#### Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	393.4	400.0	-1.7
NOx	0.1	0.0	0.1	400.0	400.0	0.0

#### Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NOx	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By: Mr. Pasagorn Samol



### บริษัท เอ็นวีเอ เซอร์วิส จำกัด

42 ถนนมิตรภาพ 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
42 Ramkham 14 year 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 13 December 2022 (วันเสาร์)

#### Instruments Information

Analyzer Type: NONOX/NOx Analyzer Model: 200A	Manufacturer: API Environmental S/N: 612
--	---

#### Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Desh Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1024	NO Conc: 55.47 PPM SO <sub>2</sub> Conc: 55.11 PPM CO Conc: 4.535 PPM Cylinder number: E30125027 Expiry Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

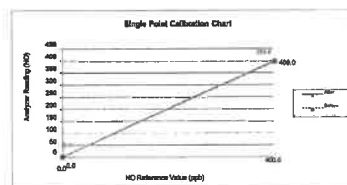
Humidity 51 %RH

#### Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	395.8	400.0	-1.1
NOx	0.1	0.0	0.1	400.0	400.0	0.0

#### Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NOx	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By: Mr. Pasagorn Samol



### บริษัท เอ็นวีเอ เซอร์วิส จำกัด

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42 Ramkham 14 year 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

### Analyzer Performance Test

Calibrated Date: 13 December 2022 (วันเสาร์)

#### Instruments Information

Analyzer Type: NONOX/NOx Analyzer Model: APHA-300	Manufacturer: Horiba Environmental S/N: 85178701.12
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#### Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Desh Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1024	NO Conc: 55.47 PPM SO <sub>2</sub> Conc: 55.11 PPM CO Conc: 4.535 PPM Cylinder number: E30125027 Expiry Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

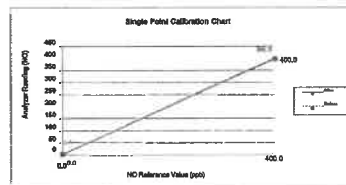
Humidity 51 %RH

#### Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.1	0.0	0.1	395.8	400.0	-0.8
NOx	0.1	0.0	0.1	400.0	400.0	0.0

#### Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.0	0.0	0.0	400.0	400.0	0.0
NOx	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By: Mr. Pasagorn Samol



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WATER ANALYSIS CENTER COMPANY LIMITED  
194 หมู่ 5 ต.นาทราย อ.สุโขทัย จ.สุโขทัย 13210  
194 Moo 5, T.Na-Sai, A.Su-Thai, Ayutthaya 13210, Thailand  
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-294

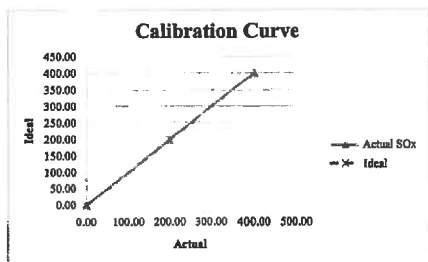
### Sulfur Dioxide Analyzer Calibration Worksheet

Project Site : กรมชลประทานโครงการชลประทานสุโขทัย  
Location : บ้านนาทราย  
Date of measurement : 13 December 2022  
Worksheet No. : C-131222-WWL 0113  
Ambient SO<sub>x</sub> Analyzer ID : WWL 0113  
Manufacturer : HORIBA  
Ambient SO<sub>x</sub> Analyzer Model : APSA-370  
Ambient SO<sub>x</sub> Analyzer S/N : WDMY8HT8

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) : 49.68  
Cylinder Pressure (psi) : 2000  
Certified Date : 07 December 2021  
Expired Date : 07 December 2025  
Serial No. : CC241587

Point	CALIBRATION RESULTS			
	Ideal	Actual SO <sub>x</sub>	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 : S. Sutit  
(Mr. SUTITWAT JAITHEERAPAKKUL)  
Chemist

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



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WATER ANALYSIS CENTER COMPANY LIMITED  
194 หมู่ 5 ต.นาทราย อ.สุโขทัย จ.สุโขทัย 13210  
194 Moo 5, T.Na-Sai, A.Su-Thai, Ayutthaya 13210, Thailand  
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-294

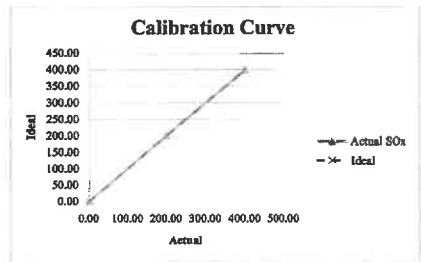
### Sulfur Dioxide Analyzer Calibration Worksheet

Project Site : กรมชลประทานโครงการชลประทานสุโขทัย  
Location : บ้านนาทราย  
Date of measurement : 13 December 2022  
Worksheet No. : C-131222-WWL 0110  
Ambient SO<sub>x</sub> Analyzer ID : WWL 0110  
Manufacturer : HORIBA  
Ambient SO<sub>x</sub> Analyzer Model : APSA-370  
Ambient SO<sub>x</sub> Analyzer S/N : YBSW7T00

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) : 49.68  
Cylinder Pressure (psi) : 2000  
Certified Date : 07 December 2021  
Expired Date : 07 December 2025  
Serial No. : CC241587

Point	CALIBRATION RESULTS			
	Ideal	Actual SO <sub>x</sub>	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 : S. Sutit  
(Mr. SUTITWAT JAITHEERAPAKKUL)  
Chemist

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



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WATER ANALYSIS CENTER COMPANY LIMITED  
194 หมู่ 5 ต.นาทราย อ.สุโขทัย จ.สุโขทัย 13210  
194 Moo 5, T.Na-Sai, A.Su-Thai, Ayutthaya 13210, Thailand  
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-294

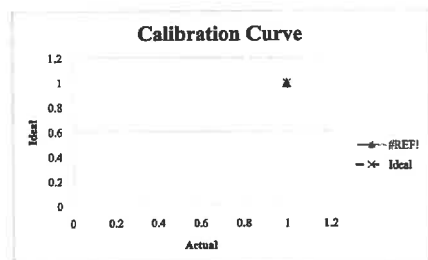
### Sulfur Dioxide Analyzer Calibration Worksheet

Project Site : กรมชลประทานโครงการชลประทานสุโขทัย  
Location : บ้านนาทราย  
Date of measurement : 13 December 2022  
Worksheet No. : C-131222-WWL 0111  
Ambient SO<sub>x</sub> Analyzer ID : WWL 0111  
Manufacturer : HORIBA  
Ambient SO<sub>x</sub> Analyzer Model : APSA-370  
Ambient SO<sub>x</sub> Analyzer S/N : PGRKTBDX

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) : 49.68  
Cylinder Pressure (psi) : 2000  
Certified Date : 07 December 2021  
Expired Date : 07 December 2025  
Serial No. : CC241587

Point	CALIBRATION RESULTS			
	Ideal	Actual SO <sub>x</sub>	Error Sox	%Error Sox
ZERO	0.00	0.10	0.10	-
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 : S. Sutit  
(Mr. SUTITWAT JAITHEERAPAKKUL)  
Chemist

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



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WATER ANALYSIS CENTER COMPANY LIMITED  
194 หมู่ 5 ต.นาทราย อ.สุโขทัย จ.สุโขทัย 13210  
194 Moo 5, T.Na-Sai, A.Su-Thai, Ayutthaya 13210, Thailand  
Tel: 0-35226-383, 0-35800-593 Fax: 0-35800-294

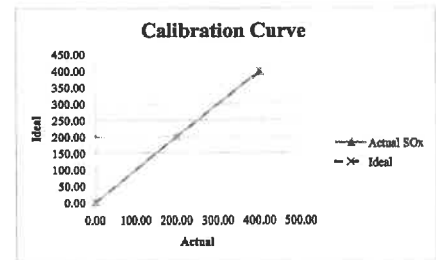
### Sulfur Dioxide Analyzer Calibration Worksheet

Project Site : กรมชลประทานโครงการชลประทานสุโขทัย  
Location : บ้านนาทราย  
Date of measurement : 13 December 2022  
Worksheet No. : C-131222-WWL 0112  
Ambient SO<sub>x</sub> Analyzer ID : WWL 0112  
Manufacturer : HORIBA  
Ambient SO<sub>x</sub> Analyzer Model : APSA-370  
Ambient SO<sub>x</sub> Analyzer S/N : SR18JBBF

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) : 49.68  
Cylinder Pressure (psi) : 2000  
Certified Date : 07 December 2021  
Expired Date : 07 December 2025  
Serial No. : CC241587

Point	CALIBRATION RESULTS			
	Ideal	Actual SO <sub>x</sub>	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 : S. Sutit  
(Mr. SUTITWAT JAITHEERAPAKKUL)  
Chemist

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



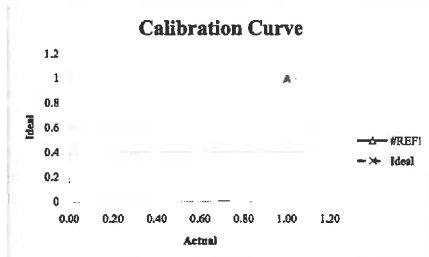
บริษัท ศูนย์วิเคราะห์น้ำ จำกัด  
WATER ANALYSIS CENTER COMPANY LIMITED  
104 หมู่ 9 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 13210  
104 Moo 9, T.Bangplai Yai, A.Bangplai, S.Mutprakarn 13210, Thailand  
Tel: 0-23229383, 0-23229393 Fax: 0-23229394

### Sulfur Dioxide Analyzer Calibration Worksheet

Project Site : กรุงเทพมหานคร เขต บางพลี  
Location : บ้านดอนทราย  
Date of measurement : 13 December 2022  
Worksheet No. : C-151222-WWL 0109  
Ambient SO<sub>2</sub> Analyzer ID : WWL 0109  
Manufacturer : HORIBA  
Ambient SO<sub>2</sub> Analyzer Model : APNA-370  
Ambient SO<sub>2</sub> Analyzer S/N : YDL359W0

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) : 49.68  
Cylinder Pressure (psi) : 2000  
Certified Date : 07 December 2021  
Expired Date : 07 December 2025  
Serial No. : CC241587

Point	CALIBRATION RESULTS			
	Ideal	Actual SO <sub>2</sub>	Error SO <sub>2</sub>	%Error SO <sub>2</sub>
ZERO	0.00	0.10	0.10	-
SPAN 200 ppb	200.00	200.10	0.10	0.85
SPAN 400 ppb	400.00	400.10	0.10	0.83
AVERAGE (%)				0.84



Calibrated by :   
(Mr. SUTTIWAT JAITHEERAPAPKUL)  
Chemist

Approved by :   
(Mr. RUNGSASIKORN KOSUM)  
Technical Manager



### บริษัท เซ็นไวร์ เซอร์วิส จำกัด

42 หมู่ 9 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
42 Ramkham 14 year 9, The Rang, Bangkok, Bangkok 10230 Tel: 02-9435814-5 Fax: 02-9438201

### Analyzer Performance Test

Calibrated Date: 13 December 2022 (วันสอบเทียบ)

#### Instruments Information

Analyzer Type: SO <sub>2</sub> Analyzer Model: 43C	Manufacturer Thermo Environmental S/N: 250818
---	--

#### Calibration System

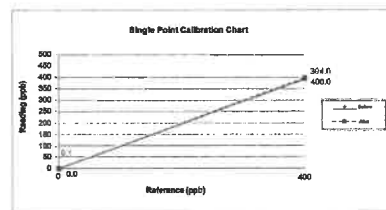
Calibrator Unit	Standard Gas
Dilutor Model Dastil Model 6008 S/N: 705	NO Conc 48.05 ppm SO <sub>2</sub> Conc 48.01 ppm CO Conc 4.487 ppm
ZERO AIR Generator API MODEL 701 S/N: 1824	Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	0.1	0.1	400.0	394.0	-1.5
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :   
Mr. PASAGORN SAMOL



### บริษัท เซ็นไวร์ เซอร์วิส จำกัด

42 หมู่ 9 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
42 Ramkham 14 year 9, The Rang, Bangkok, Bangkok 10230 Tel: 02-9435814-5 Fax: 02-9438201

### Analyzer Performance Test

Calibrated Date: 13 December 2022 (วันสอบเทียบ)

#### Instruments Information

Analyzer Type: SO <sub>2</sub> Analyzer Model: 43C	Manufacturer Thermo Environmental S/N: 50811048
---	--

#### Calibration System

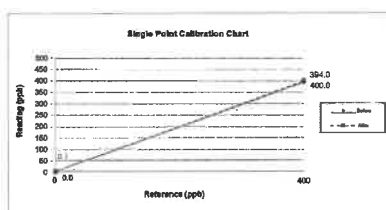
Calibrator Unit	Standard Gas
Dilutor Model Dastil Model 6008 S/N: 705	NO Conc 48.05 ppm SO <sub>2</sub> Conc 48.01 ppm CO Conc 4.487 ppm
ZERO AIR Generator API MODEL 701 S/N: 1824	Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	0.1	0.1	400.0	394.0	-1.5
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :   
Mr. PASAGORN SAMOL



### บริษัท เซ็นไวร์ เซอร์วิส จำกัด

42 หมู่ 9 ต.บางพลีใหญ่ อ.บางพลี จ.สมุทรปราการ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
42 Ramkham 14 year 9, The Rang, Bangkok, Bangkok 10230 Tel: 02-9435814-5 Fax: 02-9438201

### Analyzer Performance Test

Calibrated Date: 13 December 2022 (วันสอบเทียบ)

#### Instruments Information

Analyzer Type: SO <sub>2</sub> Analyzer Model: 100A	Manufacturer API Environmental S/N: 11192
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#### Calibration System

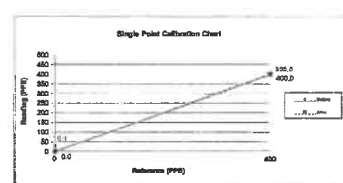
Calibrator Unit	Standard Gas
Dilutor Model Dastil Model 6008 S/N: 705	NO Conc 48.47 PPM SO <sub>2</sub> Conc 48.11 PPM CO Conc 4.535 PPM
ZERO AIR Generator API MODEL 701 S/N: 1824	Cylinder number: E30129027 Expire Date: 29 Oct. 2027

Environment: Temperature 25.5 °C

Humidity: 51 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	0.1	0.1	400.0	395.5	-1.1
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :   
Mr. PASAGORN SAMOL

### Analyzer Performance Test

Calibrated Date: 13 December 2022 (un. 9.6%)

#### Instruments Information

Analyzer Type: SO2 Analyzer  
Model: 100A  
Manufacturer: API Environmental  
S/N: 1818

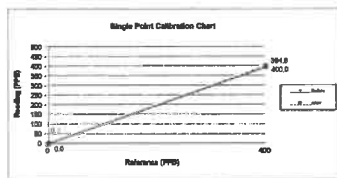
#### Calibration System

Calibrator Unit	Standard Gas
Cluster Model: Dinitro Model: 8001 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1624	NO Conc: 52.27 PPM SO2 Conc: 55.11 PPM CO Conc: 4.835 PPM Cylinder number: E80129027 Expiry Date: 29 Oct. 2027

Environment Temperature: 25.5 °C Humidity: 51 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (ppm)	Reading (ppm)	Diff (%)	Reference (ppm)	Reading (ppm)	Diff (%)
Before	0.0	0.1	0.1	400.0	394.9	-1.3
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By: Mr. PASADORN SAMOL

### Analyzer Performance Test

Calibrated Date: 13 December 2022 (uncal. 9.6%)

#### Instruments Information

Analyzer Type: SO2 Analyzer  
Model: M100A  
Manufacturer: API Environmental  
S/N: 1810

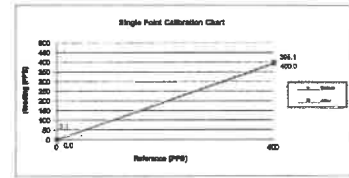
#### Calibration System

Calibrator Unit	Standard Gas
Cluster Model: Dinitro Model: 8001 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1624	NO Conc: 52.27 PPM SO2 Conc: 55.11 PPM CO Conc: 4.835 PPM Cylinder number: E80129027 Expiry Date: 29 Oct. 2027

Environment Temperature: 25.5 °C Humidity: 51 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (ppm)	Reading (ppm)	Diff (%)	Reference (ppm)	Reading (ppm)	Diff (%)
Before	0.0	0.1	0.1	400.0	395.1	-1.3
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By: Mr. PASADORN SAMOL



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0506 MTC No. EEL. BP. 58/0545

### CALIBRATION CERTIFICATE

Submitted by : WATER ANALYSIS CENTER CO., LTD.  
Address : 1/4 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., Mueang, Samutprakan 10280.

Instrument Calibrated : Ambient Environment  
Description : Sound Calibrator Temperature : (23 ± 3) °C  
Manufacturer : BSWA TECH Relative Humidity : (50 ± 5) %  
Model : CA111 Ambient Pressure : (101.325 ± 1.500) kPa  
Serial No. : 510272

- Standards used : 1. Digital Function Synthesizer NF Electronic DP-193A S/N 122037.  
2. Measuring Amplifier Bruel&Kjaer 2536 S/N 1537484.  
3. Programmable Attenuator Tamegasua TPA-303A S/N CF 2214.  
4. Digital Multimeter Agilent 34401A S/N MY44002560.  
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.  
6. Audio Analyzer Keithley 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.

PM&L/MTC.002 Rev.4

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Office/Laboratory  
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Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5237  
Fax. (66) 0 2579 8592  
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Fax. (66) 0 2579 8592  
E-mail : nmp@nitr.co.th



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0506 MTC No. EEL. BP. 58/0555

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

Nominal Output of Unit Under Test = 94 dB re 20 µPa at 1000 Hz  
Acoustic Output in dB re 20 µPa, Corrected to Reference Conditions: 101.325 kPa, 23.0 °C and 50 % RH.

#### 1. Sound Pressure Level

Standard Microphone	Measured Sound Pressure	Deviated value	Uncertainty	Tolerance limit
Type	Level (dB)	(dB)	(dB)	IEC 60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.77	-0.23	± 0.10	± 0.40 dB

#### 2. Frequency

Standard Microphone	Measured Frequency	Deviated value	Uncertainty	Tolerance limit
Type	(Hz)	(Hz)	(Hz)	IEC 60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1001.0	1.0	± 1.5	± 1.0 %

#### 3. Total distortion

Standard Microphone	Measured Total distortion	Uncertainty	Tolerance limit
Type	(%)	(%)	IEC 60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.98	± 0.50	± 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

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.

PM&L/MTC.002 Rev.4

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Fax. (66) 0 2577 9009  
Email : nmp@nitr.co.th Website: www.nitr.co.th

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Amphoe Muang, Changwat Samutprakan 10280, Thailand  
Tel. (66) 0 2579 1121-30 ext. 5219, 5225, 5237  
Fax. (66) 0 2579 8592  
E-mail : nmp@nitr.co.th

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Fax. (66) 0 2579 8592  
E-mail : nmp@nitr.co.th



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0506 MTC No. EEL. BP. 59/0565

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 Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance Limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjær 4180	113.84	-0.16	± 0.10	± 0.40 dB

### 2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance Limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjær 4180	1001.1	1.1	± 1.5	± 1.0 %

### 3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjær 4180	0.62	± 0.50	± 3.0 %

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

(Mr.Nittapong Nijrasuan)

(Mr.Tawakiat Jamsamran)

Date of Calibration : 24 May 2022

Date of Issue : 24 May 2022

Approved by :



Electrical and Electronic Standards Laboratory  
Industrial Metrology and Testing Service Centre

Ref : 2011265052002210001 3 / 3

End of Certificate

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0506

MTC No. EEL. BP. 59/0565

## CALIBRATION CERTIFICATE

Submitted by : WATER ANALYSIS CENTER CO., LTD.

Address : 194 Moo.5, T.Kanham, A.U.-Thai, Ayutthaya 13120.

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 ± 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. Pistophone 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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W	FO.LAB 64-1 /28	แก้ไขครั้งที่ : 0	วันที่แก้ไข : 1 เม.ย. 2562	หน้า : 1 ของ 1
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### แบบบันทึกการทวนสอบเครื่องวัด Sound Level Meter

เครื่อง CA111 Sound Calibrator S/N 530272 รหัสเครื่อง SR004 เกณฑ์การยอมรับ 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	วันที่สอบเทียบครั้งต่อไป 28/11/66
เครื่อง Sound Level Meter S/N 00396801	รหัสเครื่องมือ WWL 0159	วันที่สอบเทียบครั้งต่อไป 12/06/67

การทวนสอบก่อนออกหน้างาน

อุณหภูมิ (°C) 24 เกณฑ์การยอมรับ 23.0±3.0

ความชื้นสัมพัทธ์ (%) 46 เกณฑ์การยอมรับ 50.0±15.0

วันที่ทวนสอบ 13/12/65

การทวนสอบหลังออกจากหน้างาน

อุณหภูมิ (°C) 24 เกณฑ์การยอมรับ 23.0±3.0

ความชื้นสัมพัทธ์ (%) 46 เกณฑ์การยอมรับ 50.0±15.0

วันที่ทวนสอบ 22/12/65

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 ทวนสอบ	ผ่าน	ผ่าน	ผลการ ทวนสอบ	ผ่าน	ผ่าน

ผู้บันทึก

ผู้ตรวจสอบ

ผู้บันทึก

ผู้ตรวจสอบ

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0506

MTC No. EEL. BP. 59/0565

9. Power Amplifier Brüel&Kjær 2706 S/N 1517650.

10. Speaker Tannoy Limited, Great Britain British Patent No. 2153000.

11. Digital Multimeter Agilent 34401A S/N MY44005560.

12. Programmable Attenuator Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3: Periodic tests (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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### 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Unit Under Test		Deviation (dB)	Uncertainty ( $\pm$ dB)	Tolerance Limit Class 2 ( $\pm$ dB)
	Before adjust	After adjust			
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 ( $\pm$ 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 ( $\pm$ 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 ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ 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 ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ 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

4 / 8

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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 ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ 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 ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ 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 ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ 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 ( $\pm$ dB)	Tolerance Limits Class 2 ( $\pm$ 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, T <sub>b</sub> (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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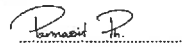
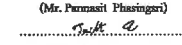
9. Peak C sound level

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 :

  
(Mr. Pannat Phasingan)  
  
(Mr. Tewikant Jansamran)

Approved by :

  
(Mr. Pannat Phasingan)  
  
(Mr. Tewikant Jansamran)

Date of Calibration : 13-14 Jun. 2022

Date of Issue : 15 Jun. 2022

Ref: 2011265052002210002

End of Certificate

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CALIBRATION CERTIFICATE

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Address : 1/94 MOO 5, T.KANHAM, A.U-THAI, AYUTTHAYA 13210.

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

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

Instrument Calibrated :

Description : Sound Level Meter

Manufacturer : Rion

Model : NL-42

Serial No. : 00395803 (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 DP-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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FMALMTC.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

9. Power Amplifier Briel&Kjaer 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 TeraGawa 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

#### 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Unit Under Test				Tolerance Limit Class 2 (±dB)
	Measured Value (dB)		Deviation (dB)	Uncertainty (±dB)	
113.91	Before adjust 114.1	After adjust 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 113.9 dB.

#### 2. Self-generated noise

##### 2.1 Normal test

Measured value (dB)	Uncertainty (±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 (±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

#### 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	-0.2	-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 (±dB)	Tolerance Limits Class 2 (±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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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

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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)
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	Time Constant, 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	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
	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	136.6	0.0	1.8
Negative one-half cycle	136.6	0.0	1.8

Calibrated by

*Mr. Panya Phasirang*

(Mr. Panya Phasirang)

(Mr. Tawakiat Jamsaran)

Date of Calibration : 13-16 Dec.2021

Date of Issue : 17 Dec. 2021

Approved by :

*Mr. Tawakiat Jamsaran*

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Ref : 2011264112604939002

End of Certificate

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W	FOLAB 6.4-1 /28	ไม่พบครั้งที่ : 0	วันที่บันทึกใช้ : 1 ม.ค. 2562	หน้า : 1 ของ 1
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แบบบันทึกการตรวจสอบเครื่อง Sound Level Meter

เครื่อง CA111 Sound Calibrator S/N 520272	วันที่ตรวจสอบ 24/05/65	วัดที่เครื่องมือ SR004	ผลการตรวจสอบ 93.77 ± 0.3, 113.84 ± 0.3
เครื่อง Digital Thermohygro Meter S/N 105091609	วันที่ตรวจสอบ 24/05/65	วัดที่เครื่องมือ WVL 0055	ผลการตรวจสอบ 23.05/66
เครื่อง Sound Level Meter S/N 00596923	วันที่ตรวจสอบ 30/11/65	วัดที่เครื่องมือ WVL 0161	ผลการตรวจสอบ 29/11/66
วันที่สอบเทียบ 13-16/12/64		วัดที่สอบเทียบ 12/12/66	

การตรวจสอบโดยห้องมาตรฐาน

อุณหภูมิ (°C) 24 ผลการตรวจสอบ 23.0±0.3

ความชื้นสัมพัทธ์ (%) 46 ผลการตรวจสอบ 50.0±15.0

วันที่ทดสอบ 13/12/65

การตรวจสอบโดยห้องมาตรฐาน

อุณหภูมิ (°C) 24 ผลการตรวจสอบ 23.0±0.3

ความชื้นสัมพัทธ์ (%) 46 ผลการตรวจสอบ 50.0±15.0

วันที่ทดสอบ 22/12/65

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	113.9	1	93.8	113.8
2	93.8	113.9	2	93.8	113.8
3	93.8	113.9	3	93.8	113.8
4	93.8	113.9	4	93.8	113.8
5	93.8	113.9	5	93.8	113.8
6	93.8	113.9	6	93.8	113.8
7	93.8	113.9	7	93.8	113.8
8	93.8	113.9	8	93.8	113.8
9	93.8	113.9	9	93.8	113.8
10	93.8	113.9	10	93.8	113.8
X	93.80	113.90	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
ผลการตรวจสอบ	ผ่าน	ผ่าน	ผลการตรวจสอบ	ผ่าน	ผ่าน

ผู้บันทึก

ผู้ตรวจสอบ

ผู้บันทึก

ผู้ตรวจสอบ



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0137

MTC No. EEL. BP. 104/1164

### 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 ± 3) °C

Manufacturer : Rion

Relative Humidity : (50 ± 15) %

Model : NL-42

Ambient Pressure : (101.325 ± 1.5) kPa

Serial No. : 00396923 (WWL 0161)

Microphone : Type UC-52 No.180583

Preamplifier : Type NH-24 No.87936

Standards used :

1. Band Pass Filter Stanford Research Systems BR 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 NP 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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Request No. 21-65/0137

MTC No. EEL. BP. 104/1164

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 Tamagawa TPA-303A S/N 2212.

Calibration Procedure :

This instrument was calibrated by using calibration procedures no CP-102-02 and CP-102-03, which were based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (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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PMBL.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. 104/1164

### 1. Absolute Sensitivity

Reference Acoustic Signal (dB)	Unit Under Test		Deviation (dB)	Uncertainty (±dB)	Tolerance Limit Class 2 (±dB)
	Measured Value (dB)	Before adjust			
113.91	114.2	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)
16.4	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	12.5	0.10
C-Weighting	17.7	0.10
Flat	23.4	0.10

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Request No. 21-65/0137

MTC No. EEL. BP. 104/1164

### 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	-0.1	0.0	0.0	0.40	2.0
1 000	-0.3	-0.3	-0.3	0.40	1.4
4 000	-0.6	-0.6	-0.6	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	0.0	0.0	0.20	2.5
125	0.0	0.0	0.0	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	0.0	0.1	0.0	0.20	2.6
4 000	0.0	0.1	0.0	0.20	3.6
8 000	0.1	0.2	0.0	0.20	5.6

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. 104/1164

## 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	136.0	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 : 13-16 Dec.2021

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Request No. 21-65/0137

MTC No. EEL. BP. 104/1164

## 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	49.0	0.0	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	27.9	-0.1	0.30	1.4

Date of Calibration : 13-16 Dec.2021

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Request No. 21-65/0137

MTC No. EEL. BP. 104/1164

## 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	26.9	-0.1	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	99.9	-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
	200	120.0	0.0	0.20	±1.3
SEL	2	100.0	0.0	0.20	+1.3; -2.8
	0.25	90.9	-0.1	0.20	+1.8; -5.3

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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		
136.7	136.7	0.0	0.30
			1.8

Calibrated by :

*Prinya Phasingiri*  
(Mr. Prinya Phasingiri)  
*Takki R.*  
(Mr. Tawakiat Jamsamru)

Approved by :

*(Mr. Rattana Kitprap)*  
Acting Director

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.: 2011264112604939001

End of Certificate

8 / 8

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E-mail : sumalee@tistr.or.th

W	FO.LAB 6-4-1 /28	แก้ไขครั้งที่: 0	วันที่มีผลใช้: 1 มี.ค. 2562	หน้า: 1 ของ 1
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### แบบบันทึกการทวนสอบเครื่องวัด Sound Level Meter

เครื่อง CA111 Sound Calibrator S/N 520272	วันที่เครื่องเมื่อ SR004	เกณฑ์การยอมรับ 93.77 ± 0.3, 113.84 ± 0.3
วันที่สอบเทียบ 24/05/65	วันที่สอบเทียบครั้งต่อไป 23/03/66	
เครื่อง Digital Thermohygro Meter S/N 105091609	วันที่เครื่องเมื่อ WWL 0085	
วันที่สอบเทียบ 30/11/65	วันที่สอบเทียบครั้งต่อไป 29/11/66	
เครื่อง Sound Level Meter S/N 222178	วันที่เครื่องเมื่อ -	
วันที่สอบเทียบ 03/03/65	วันที่สอบเทียบครั้งต่อไป 02/03/66	

การทวนสอบก่อนออกจำหน่าย	การทวนสอบหลังจากออกจำหน่าย
อุณหภูมิ (°C) 24 : เกณฑ์การยอมรับ 23.0±3.0	อุณหภูมิ (°C) 24 : เกณฑ์การยอมรับ 23.0±3.0
ความชื้นสัมพัทธ์ (%) 46 : เกณฑ์การยอมรับ 50.0±15.0	ความชื้นสัมพัทธ์ (%) 46 : เกณฑ์การยอมรับ 50.0±15.0
วันที่ทวนสอบ 13/12/65	วันที่ทวนสอบ 22/12/65

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	113.9	1	93.8	113.9
2	93.8	113.9	2	93.8	113.9
3	93.8	113.9	3	93.8	113.9
4	93.8	113.9	4	93.8	113.9
5	93.8	113.9	5	93.8	113.9
6	93.8	113.9	6	93.8	113.9
7	93.8	113.9	7	93.8	113.9
8	93.8	113.9	8	93.8	113.9
9	93.8	113.9	9	93.8	113.9
10	93.8	113.9	10	93.8	113.9
X	93.80	113.90	X	93.80	113.90
SD	0.00	0.00	SD	0.00	0.00
%RSD (≤ 10)	0.00	0.00	%RSD (≤ 10)	0.00	0.00
ผลรวม ทวนสอบ	ผ่าน	ผ่าน	ผลรวม ทวนสอบ	ผ่าน	ผ่าน

ผู้บันทึก: สจ 15/9      ผู้ตรวจสอบ: สจ 15/9  
 ผู้ตรวจทาน: [Signature]      ผู้ตรวจทาน: [Signature]

型式 TYPE: 6286      番番 PRODUCT NUMBER: 222178

## 校正証明書 CALIBRATION CERTIFICATE

品名 PRODUCT NAME : 普通騒音計  
 Sound Level Meter  
 型式 TYPE : 6286  
 番番番号 PRODUCT NUMBER : 222178  
 マイク MICROPHONE : 84142  
 製造者 MANUFACTURER : 株式会社アコー ACO CO., LTD.

### ※特記事項

[基準器、校正機器のトレーサビリティ証明]  
 校正に使用した基準器、校正機器は国家基準にトレーサブルであることを証明致します。

### ※Special notes

[Traceability certificate of standard instruments and calibration equipment]  
 We certify that the standard instruments and calibration equipment are traceable to the national standards.

2022年3月8日  
 March 8, 2022

東京都港区新橋2-8-10  
 株式会社アコー  
 代表取締役 伊藤 肇  
 2-8-10 Dai-sawa Setagaya-ku  
 Tokyo Japan  
 President : Shinichi Ito  
 ACO CO., LTD.

### 1 試験成績 Test Results

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

### 2 試験条件 Test Requirements

試験日 Test date : 2022年3月8日 March 8, 2022  
 温度 Temperature : 24 °C  
 湿度 Humidity : 40 %  
 気圧 Barometric pressure : 990 hPa

### 3 使用機器 Used Equipment

デジタル・マルチメータ Digital Multimeter 84401A No. MY45089877  
 (有効期間 : 2021年3月から2022年3月)  
 (Effective life : from March, 2021 to March, 2022)

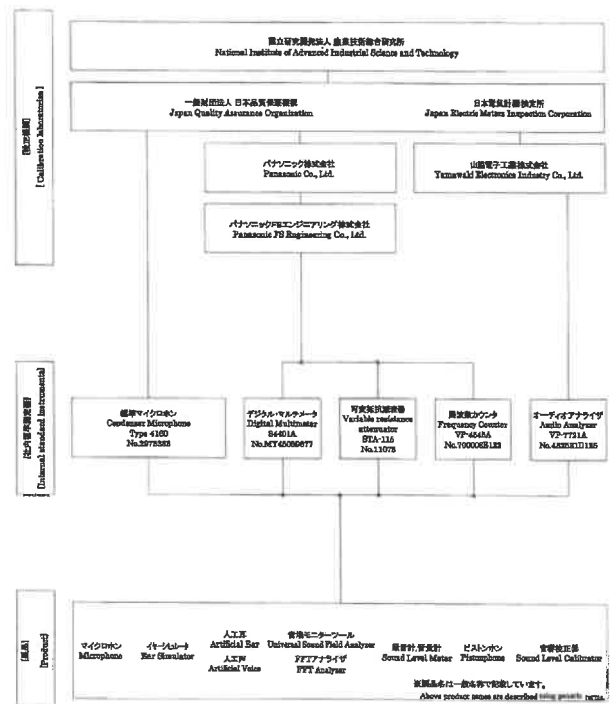
可変抵抗減衰器 Variable resistance attenuator STA-115 No. 11076  
 (有効期間 : 2021年3月から2022年3月)  
 (Effective life : from March, 2021 to March, 2022)

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

オーディオアナライザ Audio Analyzer VP-7721A No. 482631D125  
 (有効期間 : 2021年3月から2022年3月)  
 (Effective life : from March, 2021 to March, 2022)

標準マイクロホン Condenser Microphone 4160 No. 2978388  
 (有効期間 : 2021年7月から2023年7月)  
 (Effective life : from July, 2021 to July, 2023)

### トレーサビリティ体系図 Traceability Flow Chart



株式会社アコー  
 ACO CO., LTD.

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

本体製造番号  
Serial No. of body: 222178  
マイクホン製造番号  
Serial No. of Microphone: 84142

Ver:5.0 22-01-08

年月日: 2022年3月3日  
Date: March 3, 2022

承認 Approved	点検 Passed	担当 Inspected
<i>A. Nagata</i>	<i>y. Nagata</i>	<i>N. Yamamoto</i>

株式会社 アコー  
ACO CO., LTD.

1. 検査年月日 Inspection Date

2022年3月3日 March 3, 2022

2. 検査条件 Inspection Condition

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

3. 検査項目及び結果 Inspection Results

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

RANGE : 20-100dB 70dB 入力基準  $\pm 0.7$ dB以下

Within  $\pm 0.7$ dB of the value at 70dB input, Range 20-100dB.

RANGE (dB)	入力レベル Input level (dB)	周波数 Frequency (Hz)	81.5	1000	8000
20-80	70	0.0	0.0	-0.1	-0.1
20-90	70	0.0	0.1	0.0	0.0
20-110	70	0.1	0.1	0.1	0.2
80-120	70	-0.1	-0.1	0.0	0.0
40-130	70	-0.2	-0.1	-0.1	-0.1
判定	Passed			Pass	

2) 安定性特性検査 Stability Characteristic

RANGE : 20-100dB 1分後基準  $\pm 0.6$ dB以下

Within  $\pm 0.5$ dB of the value one minute later, Range 20-100dB.

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

3) 目盛誤差特性検査 The Scale Error

RANGE : 20-120dB 31.5Hzは75.0dB入力基準 1kHz, 8kHzは95dB入力基準

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

A特性 A weighting A特性 A weighting

入力 Input (dB)	規格 Standard (dB)	周波数 Frequency (Hz)	31.5
120			
115			
110			
105			
100			
95			
90			
85			
80	$\pm 0.5$	0.1	
75	$\pm 0.5$	0.0	
70	$\pm 0.5$	-0.1	
65	$\pm 0.5$	-0.2	
60	$\pm 0.5$	0.2	
55	$\pm 0.5$	-0.3	
50	$\pm 0.5$	0.0	
45	$\pm 0.5$	-0.1	
40	$\pm 0.5$	-0.1	
35	$\pm 0.5$	0.1	
30	$\pm 0.5$	0.5	
判定	Passed	Pass	

4) 動特性検査 Dynamic Characteristic

RANGE : 20-100dB 100dB, 1kHz 入力基準

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

	規格 Standard	測定 Measured Value
FAST	-1.0 $\pm$ 0.5 (dB)	-1.5
	-1.0	
SLOW	-4.0 $\pm$ 1.0 (dB)	-4.5
判定	Passed	Pass

5) 周波数特性検査 Frequency Response

RANGE : 20-100dB 95dB入力基準(マイクを含む)

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

周波数 Frequency (Hz)	規格 Standard (dB)	A特性 レスポンス Response (dB)	偏差 Deviation (dB)	規格 Standard (dB)	C特性 レスポンス Response (dB)	偏差 Deviation (dB)	Z特性 レスポンス Response (dB)	許容差 Tolerance (dB)
10	-70.4	-69.6	0.8	-14.3	-13.0	1.3	-0.2	$\pm 5.0$ - $\infty$
20	-50.5	-50.9	-0.4	-6.2	-5.8	0.4	-0.3	$\pm 3.0$
40	-34.6	-35.1	-0.5	-2.0	-2.1	-0.1	-0.1	$\pm 2.0$
100	-19.1	-19.5	-0.4	-0.3	-0.4	-0.1	-0.1	$\pm 1.5$
250	-8.6	-8.8	-0.2	0.0	-0.1	-0.1	-0.1	$\pm 1.5$
500	-3.2	-3.3	-0.1	0.0	0.0	0.0	0.0	$\pm 1.5$
1000	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	$\pm 1.0$
2k	1.2	1.1	-0.1	-0.2	-0.8	-0.1	-0.1	$\pm 2.0$
4k	1.0	0.6	-0.4	-0.8	-1.4	-0.6	-0.8	$\pm 3.0$
8k	-1.1	-2.6	-1.4	-3.0	-4.5	-1.5	-1.2	$\pm 5.0$
10k	-2.5	-4.0	-1.5	-4.4	-6.0	-1.6	-1.6	$\pm 5.0$ - $\infty$
20k	-9.8	-9.2	0.6	-11.2	-11.8	-0.6	-2.2	$\pm 5.0$ - $\infty$
判定	Passed				Pass			

6) 実効値指示傾差検査 波高率3のバースト信号に対して1.0dB以内

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

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

実効値指示傾差 Effective value Error (dB)	判定
0.3	Pass

7) 自己雑音特性検査 Self-noise

RANGE : 20-80dB

RANGE : 20-80dB (including Microphone value)	A特性	C特性	Z特性
規格 Standard (dB)	22以下 Below 22	30以下 Below 30	32以下 Below 32
自己雑音 Self-noise (dB)	19.1	27.0	29.7
判定	Passed		Pass

試験・校正成績書  
( Calibration Report )

成継書番号 39710K

発行日: 2021年3月18日

校正証明書

貴社名 株式会社 アー

下記製品は、当社の作業規程に従って校正が行われていることを証明します。  
この校正に使用した標準器は、パナソニックF Sエンジニアリング株式会社、メーカー  
JEMCO(日本電気計器株式会社)、JQA(日本品質保証機構)などを通じて  
国家標準、またはNIST(National Institute of Standards and Technology)  
などにトレーサビリティがとれています。

管理番号 EMC-1 0013  
品名 デジタルマルチメータ  
型式 34401A  
製造番号 MY45039877  
校正年月日 2021年3月18日  
環境条件 温度 23℃ 湿度 50%  
発行番号 202101351

使用標準器

管理番号	型式	製造番号	名称	有効期限
ST-031	5700A	4635001	キヤリアー	2021/10

〒581-0854 大阪府豊中市龍岸町3丁目1番1号

パナソニックF Sエンジニアリング株式会社

OS統括部 校正サービス課

校正証明書発行責任者 佐藤 信

管理番号(Control Number)	EMC-1 0013
品名(Description)	デジタルマルチメータ
製造者(Manufacturer)	Agilent Technologies
型式(Model Number)	34401A
製造番号(Serial Number)	MY45039877
依頼者(Customer)	株式会社 アー
校正日(Calibration Date)	2021年3月18日
温度(Temperature)	23 °C
湿度(Humidity)	50 %
校正者(Calibrated by)	佐藤 信
総合判定(Judgement)	合格/Pass
承認者(Approved by)	

備考

標準器(Standard)

管理番号 (Control Number)	型式 (Model Number)	製造番号 (Serial Number)	名称 (Description)
ST-031	5700A	4635001	キヤリアー

この成績書に記載する標準器は国家標準にトレーサブルである。

パナソニックF Sエンジニアリング株式会社

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試験・校正成績書

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

DC V	レンジ /Range	標準入力 /Input	下限 /Lower Limit	測定値 /Measured Value	上限 /Upper Limit	判定 /Result
100 mV	100 mV	100 mV	99.999 5 mV	100.000 0 mV	100.000 5 mV	PASS
1 V	0.2 V	0.199 999 V	0.199 999 V	0.200 016 V	0.200 023 V	PASS
1 V	0.4 V	0.399 977 V	0.399 999 V	0.400 023 V	0.400 023 V	PASS
1 V	0.6 V	0.599 989 V	0.599 999 V	0.600 031 V	0.600 031 V	PASS
1 V	0.8 V	0.799 981 V	0.799 999 V	0.800 039 V	0.800 039 V	PASS
1 V	1.0 V	0.999 963 V	0.999 999 V	1.000 047 V	1.000 047 V	PASS
1 V	-0.2 V	-0.200 015 V	-0.200 000 V	-0.199 985 V	-0.199 985 V	PASS
1 V	-0.4 V	-0.400 023 V	-0.400 000 V	-0.399 977 V	-0.399 977 V	PASS
1 V	-0.6 V	-0.600 031 V	-0.599 999 V	-0.599 969 V	-0.599 969 V	PASS
1 V	-0.8 V	-0.800 039 V	-0.799 999 V	-0.799 961 V	-0.799 961 V	PASS
1 V	-1.0 V	-1.000 047 V	-0.999 997 V	-0.999 963 V	-0.999 963 V	PASS
10 V	10 V	9.999 60 V	9.999 89 V	10.000 40 V	10.000 40 V	PASS
100 V	100 V	99.994 9 V	100.000 2 V	100.005 1 V	100.005 1 V	PASS
1000 V	1000 V	999.945 V	999.994 V	1.000.065 V	1.000.065 V	PASS

AC V	周波数 /Frequency	レンジ /Range	標準入力 /Input	下限 /Lower Limit	測定値 /Measured Value	上限 /Upper Limit	判定 /Result
400 Hz	100 mV	100 mV	99.999 5 mV	100.000 0 mV	100.000 5 mV	PASS	
400 Hz	1 V	1 V	0.999 100 V	1.000 830 V	1.000 900 V	PASS	
400 Hz	10 V	10 V	9.991 00 V	10.008 46 V	10.009 00 V	PASS	
400 Hz	100 V	100 V	99.910 0 V	99.991 4 V	100.000 0 V	PASS	
400 Hz	750 V	750 V	699.355 V	699.879 V	700.845 V	PASS	

抵抗(Ω)	レンジ /Range	標準入力 /Input	下限 /Lower Limit	測定値 /Measured Value	上限 /Upper Limit	判定 /Result
100 Ω	100 Ω	100 Ω	99.999 9 kΩ	100.000 0 kΩ	100.000 5 kΩ	PASS
1 kΩ	1 kΩ	1 kΩ	0.999 890 kΩ	1.000 050 kΩ	1.000 110 kΩ	PASS
10 kΩ	10 kΩ	10 kΩ	9.999 90 kΩ	10.000 50 kΩ	10.001 10 kΩ	PASS
100 kΩ	100 kΩ	100 kΩ	99.989 0 kΩ	100.003 7 kΩ	100.011 0 kΩ	PASS
1 MΩ	1 MΩ	1 MΩ	0.999 990 MΩ	1.000 033 MΩ	1.000 110 MΩ	PASS
10 MΩ	10 MΩ	10 MΩ	9.999 80 MΩ	9.999 99 MΩ	10.004 10 MΩ	PASS
100 MΩ	100 MΩ	100 MΩ	99.180 0 MΩ	100.797 8 MΩ	100.810 0 MΩ	PASS

DC I	レンジ /Range	標準入力 /Input	下限 /Lower Limit	測定値 /Measured Value	上限 /Upper Limit	判定 /Result
10 mA	10 mA	10 mA	9.993 00 mA	9.999 10 mA	10.007 00 mA	PASS
100 mA	100 mA	100 mA	99.945 0 mA	99.987 8 mA	100.056 0 mA	PASS
1 A	1 A	1 A	0.998 900 A	0.999 788 A	1.001 100 A	PASS
10 A	10 A	10 A	9.998 20 A	9.999 84 A	1.001 80 A	PASS

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

パナソニックF Sエンジニアリング株式会社

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校正証明書

発行日: 2021年3月18日

貴社名 株式会社 アー

下記製品は、当社の作業規程に従って校正が行われていることを証明します。  
この校正に使用した標準器は、パナソニックF Sエンジニアリング株式会社、メーカー  
JEMCO(日本電気計器株式会社)、JQA(日本品質保証機構)などを通じて  
国家標準、またはNIST(National Institute of Standards and Technology)  
などにトレーサビリティがとれています。

管理番号 EMC-1 0008  
品名 可変抵抗減衰器  
型式 STA-115  
製造番号 11078  
校正年月日 2021年3月18日  
環境条件 温度 23℃ 湿度 50%  
発行番号 202101353

使用標準器

管理番号	型式	製造番号	名称	有効期限
ST-031	5700A	4635001	キヤリアー	2021/10
EO-027	URE3	101273	RMS/PEAK 電圧計	2021/8

〒581-0854 大阪府豊中市龍岸町3丁目1番1号

パナソニックF Sエンジニアリング株式会社

OS統括部 校正サービス課

校正証明書発行責任者 佐藤 信

試験・校正成績書  
(Calibration Report)

成績書番号 39711K

管理番号 (Control Number)	EMO-1 0006		
品名 (Description)	可変抵抗減衰器		
製造者 (Manufacturer)	TOKYO KO-ON DENPA		
型式 (Model Number)	STA-115		
製造番号 (Serial Number)	11075		
依頼者 (Customer)	株式会社 73		
校正日 (Calibration Date)	2021年3月18日		
温度 (Temperature)	23 °C		
湿度 (Humidity)	50 %		
校正者 (Calibrated by)	水澤 和弘		
総合判定 (Judgement)	合格/Pass		
承認者 (Approved by)			
備考			
標準器 (Standard)	型式	製造番号	名称
管理番号	型式	製造番号	名称
ST-031	5700A	4635001	ナリダ レー
ED-027	URE3	101273	RMS/PEAK 電圧計

この成績書に記載する標準器は国家標準にトレーサブルである。

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試験・校正成績書

型式 STA-115 製造番号 11075 管理番号 EMO-1 0006

周波数 Frequency	減衰値 Attenuation	許容誤差 Accuracy	下限 Lower Limit	校正値 Calibration Value	上限 Upper Limit	判定 Result
1 kHz	0.1 dB	0 dB	0.05 dB	0.0 (REF.) dB	0.15 dB	PASS
1 kHz	0.1 dB	0.1 dB	0.15 dB	0.20 dB	0.25 dB	PASS
1 kHz	0.1 dB	0.2 dB	0.25 dB	0.30 dB	0.35 dB	PASS
1 kHz	0.1 dB	0.3 dB	0.35 dB	0.40 dB	0.45 dB	PASS
1 kHz	0.1 dB	0.4 dB	0.45 dB	0.50 dB	0.55 dB	PASS
1 kHz	0.1 dB	0.5 dB	0.55 dB	0.60 dB	0.65 dB	PASS
1 kHz	0.1 dB	0.6 dB	0.65 dB	0.70 dB	0.75 dB	PASS
1 kHz	0.1 dB	0.7 dB	0.75 dB	0.80 dB	0.85 dB	PASS
1 kHz	0.1 dB	0.8 dB	0.85 dB	0.90 dB	0.95 dB	PASS
1 kHz	0.1 dB	0.9 dB	0.95 dB	1.00 dB	1.05 dB	PASS
1 kHz	1 dB	1 dB	0.90 dB	1.00 dB	1.10 dB	PASS
1 kHz	1 dB	2 dB	1.90 dB	2.00 dB	2.10 dB	PASS
1 kHz	1 dB	3 dB	2.90 dB	3.01 dB	3.10 dB	PASS
1 kHz	1 dB	4 dB	3.90 dB	4.01 dB	4.10 dB	PASS
1 kHz	1 dB	5 dB	4.90 dB	5.01 dB	5.10 dB	PASS
1 kHz	1 dB	6 dB	5.90 dB	6.01 dB	6.10 dB	PASS
1 kHz	1 dB	7 dB	6.90 dB	7.01 dB	7.10 dB	PASS
1 kHz	1 dB	8 dB	7.90 dB	8.01 dB	8.10 dB	PASS
1 kHz	1 dB	9 dB	8.90 dB	9.01 dB	9.10 dB	PASS
1 kHz	1 dB	10 dB	9.90 dB	10.00 dB	10.10 dB	PASS
1 kHz	10 dB	10 dB	9.70 dB	10.02 dB	10.30 dB	PASS
1 kHz	10 dB	20 dB	19.70 dB	19.99 dB	20.30 dB	PASS
1 kHz	10 dB	30 dB	29.70 dB	29.97 dB	30.30 dB	PASS
1 kHz	10 dB	40 dB	39.70 dB	40.04 dB	40.30 dB	PASS
1 kHz	10 dB	50 dB	49.70 dB	50.06 dB	50.30 dB	PASS
1 kHz	20 dB	20 dB	19.70 dB	20.02 dB	20.30 dB	PASS
1 kHz	20 dB	40 dB	39.70 dB	40.07 dB	40.30 dB	PASS

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校正証明書

発行日: 2021年3月18日

貴社名 株式会社 73

下記製品は、当社の作業規程に従って校正が行われていることを証明します。  
この校正に使用した標準器は、パナソニックSMTAパナソニック/FS-株式会社、メーカ-  
JEMC(日本電気計器校正所)、JQA(日本品質保証機構)などを通じて  
国家標準、またはNIST(National Institute of Standards and Technology)  
などにトレーサブルがとれています。

管理番号 EMO-1 0005  
品名 周波数カウンタ  
型式 VP-4545A  
製造番号 700008E122  
校正年月日 2021年3月18日  
環境条件 温度 23°C 湿度 50%  
発行番号 202101464

使用標準器

管理番号	型式	製造番号	名称	有効期限
EO-030	FT-001S	1504010016	時間周波数基準校正装置	2021/3
EO-037	S3250A	MY40009937	77777777777777777777	2021/3

〒591-0854 大阪府豊中市番津町3丁目1番1号  
パナソニックFSエンジニアリング株式会社  
OS統括部 校正サービス課  
校正証明書発行責任者 佐藤 慎一

試験・校正成績書  
(Calibration Report)

成績書番号 39712K

管理番号 (Control Number)	EMO-1 0005		
品名 (Description)	周波数カウンタ		
製造者 (Manufacturer)	Panasonic		
型式 (Model Number)	VP-4545A		
製造番号 (Serial Number)	700008E122		
依頼者 (Customer)	株式会社 73		
校正日 (Calibration Date)	2021年3月18日		
温度 (Temperature)	23 °C		
湿度 (Humidity)	50 %		
校正者 (Calibrated by)	水澤 和弘		
総合判定 (Judgement)	合格/Pass		
承認者 (Approved by)			
備考			
標準器 (Standard)	型式	製造番号	名称
管理番号	型式	製造番号	名称
EO-030	FT-001S	1504010016	時間周波数基準校正装置
EO-037	S3250A	MY40009937	77777777777777777777

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# 試験・校正成績書

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

入力感度試験/Sensitivity (1kHz)

入力レベル /INPUT LEVEL	OK/NG	判定 /Result
INPUT A		
INPUT A (ノイズ)	OK	PASS
INPUT B	OK	PASS

基準時間精度試験/Tolerance

スパン	下限 /Lower Limit	測定値 /Measured Value	上限 /Upper Limit	判定 /Result
10 Hz	8.999 50 MHz	10.000 00 MHz	10.000 50 MHz	PASS
OPT 67	8.999 850 MHz		10.000 850 MHz	N/A
OPT 27	8.999 950 MHz		10.000 950 MHz	N/A

一般動作

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

パナソニック S エンジニアリング株式会社

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証明番号: Y1557  
発行年月日: 2021年3月18日

## 校正証明書

依頼者: 株式会社アコー様

製品名: オーディオアナライザ

型式名: VP-7721A

製造番号: 482531D125

校正実施日: 2021年3月18日

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また、一部の測定は自然物定数もしくは合算標準にトレースしています。

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使用標準器

型式名	製造番号	製品名	有効期限
5700A	5745005	マルチファンクショナル校正器	2021年05月
3458A	US28027686	9 * 3 * 3 * 3 * 3 * 3 * 3	2021年05月
53132A	MY40001181	ユニバーサルアナライザ	2021年05月
VP-7722A	590018A122	オーディオアナライザ	2021年05月
AC-12B	M-61122004	標準計校正器	2021年05月
MS-443B	M-46748	デジタルオシロスコープ	2021年05月

山脇電子工業株式会社  
Yamawaki Electronics Industry Co., Ltd.  
〒151-0072 東京都港区南青山4-1-7 TEL: 03-3465-3421



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YD2016-018

# 試験成績書

繰数 3 枚中 1 枚

製造番号: YD-210308

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

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

判定: 合格

試験の結果は、下記であることを証明します。  
この校正に際する測定は、国際標準にトレーサビリティがとれています。



試験項目	規格	測定点	測定値	判定
周波数	± 3 %以内 (全範囲) ± 2 %以内 (0.16 kHz~15.99 kHz)	周波数	測定値	判定
		10 Hz	10.13 Hz	良
		20 Hz	20.25 Hz	良
		50 Hz	50.55 Hz	良
		400 Hz	404.17 Hz	良
		1 kHz	1.01 Hz	良
		20 kHz	20.031 kHz	良
		50 kHz	50.014 kHz	良
		100 kHz	99.856 kHz	良
		出力	測定値	判定
出力範囲	± 0.5 dB (4 dB~35.9 dB) ± 0.8 dB (~36 dB以下)	4.0 dB	3.53 dB	良
		1.5 dB	1.43 dB	良
		-1.0 dB	-1.08 dB	良
		-3.5 dB	-3.58 dB	良
		-6.0 dB	-6.03 dB	良
		-16.0 dB	-16.03 dB	良
		-35.9 dB	-35.87 dB	良
		-36.0 dB	-36.05 dB	良
		-75.9 dB	-75.81 dB	良
		フラットネス	測定値	判定
フラットネス	1 kHz基準 ± 0.3 dB (全範囲) ± 0.1 dB (20 Hz~20 kHz)	周波数	測定値	判定
		10 Hz	-0.02 dB	良
		20 Hz	-0.02 dB	良
		50 Hz	-0.02 dB	良
		20 kHz	0.03 dB	良
		50 kHz	0.02 dB	良
		100 kHz	-0.03 dB	良
		周波数	測定値	判定
		10 Hz	-0.21 dB	良
		20 Hz	-0.04 dB	良

山脇電子工業株式会社

YD2000-15a

繰数 3 枚中 2 枚

製造番号: YD-210308

試験項目	規格	測定点	測定値	判定
周波数	± 0.3 % (全範囲) ± 0.005 % (30 Hz~49.9 kHz, 20 kHz~39.9 kHz) ± 0.002 % (50 Hz~19.99 kHz, 80 kHz BW)	周波数	測定値	判定
		10 Hz	0.00147 %	良
		20 Hz	0.00150 %	良
		50 Hz	0.00108 %	良
		400 Hz	0.00031 %	良
		1 kHz	0.00029 %	良
		20 kHz	0.00093 %	良
		50 kHz	0.00153 %	良
		100 kHz	0.00419 %	良
熱電圧	<10 μV (500 kHz BW)	熱電圧	測定値	判定
		4.2 μV	良	
ACV測定	75 dB~40 ± 3 % UNBAL	レンジ	入力電圧	判定
		100 V	100.0 V	良
		30 V	30.00 V	良
		10 V	10.00 V	良
		3 V	3.000 V	良
		1 V	1.000 V	良
		300 mV	300.0 mV	良
		100 mV	100.0 mV	良
		30 mV	30.00 mV	良
		10 mV	10.00 mV	良
フラットネス	1 kHz基準 ± 0.5 dB (20 Hz~100 kHz) ± 3 dB (5 Hz~500 kHz)	周波数	測定値	判定
		10 Hz	-0.21 dB	良
		20 Hz	-0.04 dB	良
		50 Hz	0.02 dB	良
		10 kHz	-0.05 dB	良
		20 kHz	-0.07 dB	良
		50 kHz	-0.12 dB	良
		100 kHz	-0.23 dB	良
		200 kHz	-0.08 dB	良

山脇電子工業株式会社

YD2000-15a

規格 3 枚中 3 枚

管理番号 : YD-210308


試験項目	規格	測定点	測定値	判定	
ひずみ率	第2音圧レベル	周波数	レンジ	測定値	判定
			- 10 dB	-9.60 dB	良
		400 Hz	- 40 dB	-39.65 dB	良
			- 60 dB	-59.40 dB	良
		1 kHz	- 10 dB	-10.05 dB	良
			- 40 dB	-39.95 dB	良
		20 kHz	- 60 dB	-59.55 dB	良
			- 10 dB	-10.95 dB	良
		50 kHz	- 40 dB	-40.80 dB	良
			- 60 dB	-60.25 dB	良
	基本振数電圧	周波数	レンジ	測定値	判定
			400 Hz	107.0 dB	良
		1 kHz	108.0 dB	良	良
	100 dB (5 Hz~15.99 kHz)	20 kHz	94.5 dB	良	良
	90 dB (16 kHz~50 kHz)				
	86 dB (50 kHz~159.9 kHz)				
無負荷ひずみ率	DnC1 V	周波数	レンジ	測定値	判定
			10 Hz	-96.8 dB	良
		20 kHz	- 40 dB	-97.4 dB	良
			- 60 dB	-99.5 dB	良
		15 kHz	- 40 dB	-98.7 dB	良
			- 60 dB	-93.8 dB	良
		50 kHz	- 40 dB	-93.8 dB	良
			- 60 dB	-87.4 dB	良
		100 kHz	- 40 dB	-87.4 dB	良
			- 60 dB	-87.4 dB	良
フィルター	検査仕様				判定
	HPF	400 Hz	oct/-18 dB A 特性	良	良
	LPF	30 kHz	oct/-18 dB A 特性	良	良
		80 kHz	oct/-18 dB A 特性	良	良

山陽電子工業株式会社

w-0000-100

山崎電子工業株式会社

JD000-12a

 <b>JCSS</b> JCSS 0028		総数 2頁の1頁 証明書番号 1351-01114
<h2>校正証明書</h2>		
依頼者	株式会社アコー	
住所	東京都世田谷区代沢2-6-10	
品名	標準マイクロホン	
型式	4160	
製造番号	2973383	
製造者	Brüel & Kjær	
校正項目	音圧レベル	
校正方法	IEC 61094-2に準拠した相互校正法を用いた音圧絶対校正	
校正条件	別紙のとおり	
校正実施場所	東京都八王子市南大沢四丁目4番地4 一般財団法人 日本品質保証機構 計量計測センター 計器検定部校正室	
校正年月日	2021年7月8日	
校正結果は次頁以降のとおりであることを証明します。		
2021年7月12日 東京都八王子市南大沢四丁目4番地4 一般財団法人 日本品質保証機構 計量計測センター 所長 佐野 弘		
この証明書は、計量法第14条第1項に基づきのものであり、特定標準器(国家標準)にトレーサブルな標準器により校正した結果を示すものです。 審判による承認をなし、この証明書のカラーコピー及び一部分のみを複製して使用することを禁じます。 当センターは、ISO/IEC 17025:2017に基づき校正機関として認定されています。		

## 校正結果

### 音圧レベル

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

校正の不確かさ(k=2):

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

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

### 校正条件

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

### 特記事項

校正品の受取後、修理及び調整を行わず校正を実施した。

以上

W	FO.LAB 6.4-1/28	測定場所: 0	วันที่รับส่ง: 13 JUL 2562	หน้า: 1 จาก 1
แบบบันทึกการทวนสอบเครื่อง Sound Level Meter				
เครื่อง CA111 Sound Calibrator S/N 520272	วันที่ทวนสอบ 24/05/65	รหัสเครื่องสอบ SR004	ผลการทวนสอบ 93.77 ± 0.3, 113.84 ± 0.3	วันที่สอบเทียบครั้งที่ต่อไป 23/05/66
เครื่อง Digital Thermohygro Meter S/N 105091609	วันที่สอบเทียบ 30/11/65	รหัสเครื่องสอบ WWL0055	วันที่สอบเทียบครั้งที่ต่อไป 29/11/66	
เครื่อง Sound Level Meter S/N 222179	วันที่สอบเทียบ 03/03/65	รหัสเครื่องสอบ -	วันที่สอบเทียบครั้งที่ต่อไป 02/03/66	
การทวนสอบก่อนออกจำหน่าย				
อุณหภูมิ (°C) 24	ผลการทวนสอบ 23.04 ± 0.0	อุณหภูมิ (°C) 24	ผลการทวนสอบ 23.04 ± 0.0	
ความชื้นสัมพัทธ์ (%) 46	ผลการทวนสอบ 50.0 ± 1.0	ความชื้นสัมพัทธ์ (%) 46	ผลการทวนสอบ 50.0 ± 1.0	
วันที่ทวนสอบ 13/12/65		วันที่ทวนสอบ 22/12/65		
Item	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 94.0 dB)	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0 dB)	Item	ระดับเสียงที่วัดได้ (dB) (ความดังที่ 94.0 dB) / ระดับเสียงที่วัดได้ (dB) (ความดังที่ 114.0 dB)
1	93.8	113.9	1	93.8 / 113.9
2	93.8	113.9	2	93.8 / 113.9
3	93.8	113.9	3	93.8 / 113.9
4	93.8	113.9	4	93.8 / 113.9
5	93.8	113.9	5	93.8 / 113.9
6	93.8	113.9	6	93.8 / 113.9
7	93.8	113.9	7	93.8 / 113.9
8	93.8	113.9	8	93.8 / 113.9
9	93.8	113.9	9	93.8 / 113.9
10	93.8	113.9	10	93.8 / 113.9
X	93.80	113.90	X	93.80 / 113.90
SD	0.00	0.00	SD	0.00 / 0.00
%RSD (≤ 10)	0.00	0.00	%RSD (≤ 10)	0.00 / 0.00
ผลการทวนสอบ	ผ่าน	ผ่าน	ผลการทวนสอบ	ผ่าน / ผ่าน

ผู้บันทึก 27/4/9  
ผู้ตรวจสอบ

ผู้บันทึก 27/4/9  
ผู้ตรวจสอบ



1. 検査年月日 Inspection Date  
2023年3月8日 March 8, 2022

2. 検査条件 Inspection Condition

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

3. 検査項目及び結果 Inspection Results

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

RANGE : 20-100dB 70dB 入力基準 ±0.7dB以下

Within ±0.7dB of the value at 70dB input, Range 20-100dB.

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

2) 安定性特性検査 Stability Characteristic

RANGE : 20-100dB 1分後基準 ±0.5dB以下

Within ±0.5dB of the value one minute later, Range 20-100dB.

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

3) 目盛誤差特性検査 The Scale Error

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

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

A特性 A weighting

入力 Input (dB)	規格 Standard (dB)	周波数 Frequency (Hz)	31.5
120			
115			
110			
105			
100			
95			
90			
85			
80	±0.6	0.0	
75	0.0	0.0	
70	±0.6	-0.1	
65	±0.6	-0.2	
60	±0.6	-0.2	
55	±0.6	-0.2	
50	±0.6	-0.1	
45	±0.6	-0.1	
40	±0.6	-0.2	
35	±0.6	0.0	
30	±0.6	0.4	
判定	Passed	Pass	

A特性 A weighting

入力 Input (dB)	規格 Standard (dB)	周波数 Frequency (Hz)	1000	8000
120	±0.6	0.0	0.0	
115	±0.6	-0.1	0.0	
110	±0.6	-0.1	0.0	
105	±0.6	-0.1	0.0	
100	±0.6	0.0	0.0	
95	±0.6	0.0	0.0	
90	±0.6	-0.1	-0.1	
85	±0.6	-0.1	-0.1	
80	±0.6	-0.1	0.0	
75	±0.6	-0.2	-0.1	
70	±0.6	-0.2	-0.1	
65	±0.6	-0.3	-0.2	
60	±0.6	-0.3	-0.2	
55	±0.6	-0.2	-0.2	
50	±0.6	0.0	-0.2	
45	±0.6	-0.1	-0.1	
40	±0.6	-0.1	-0.2	
35	±0.6	0.1	0.0	
30	±0.6	0.4	0.4	
判定	Passed	Pass		

4) 動特性検査 Dynamic Characteristic

RANGE : 20-100dB 100dB, 1kHz 入力基準

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

	規格 Standard	測定 Measured Value
FAST	-1.0±0.5 (dB)	-1.5
SLOW	-4.0±1.0 (dB)	-4.6
判定	Passed	Pass

- 1 -

- 2 -

5) 周波数特性検査 Frequency Response

RANGE : 20-100dB 95dB入力基準(マイクを含む)

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

周波数 Frequency (Hz)	規格 Standard (dB)	A特性 Response (dB)	偏差 Deviation (dB)	規格 Standard (dB)	C特性 Response (dB)	偏差 Deviation (dB)	Z特性 Response (dB)	許容差 Tolerance (dB)
10	-70.4	-69.7	0.7	-14.3	-12.7	1.6	-0.8	±5.0, ∞
20	-60.5	-61.0	-0.5	-6.2	-5.9	0.3	-0.1	±3.0
40	-34.6	-35.1	-0.5	-2.0	-2.1	-0.1	0.0	±2.0
100	-19.1	-19.5	-0.4	-0.3	-0.3	0.0	-0.1	±1.5
250	-8.6	-8.8	-0.2	0.0	-0.1	-0.1	-0.1	±1.5
500	-3.2	-3.4	-0.2	0.0	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	±1.0
2k	1.2	1.0	-0.2	-0.2	-0.4	-0.2	-0.2	±2.0
4k	1.0	0.4	-0.6	-0.6	-1.6	-0.7	-0.4	±3.0
8k	-1.1	-2.4	-1.3	-3.0	-4.4	-1.4	-1.2	±5.0
10k	-2.5	-3.9	-1.4	-4.4	-5.8	-1.6	-1.6	±5.0, ∞
20k	-9.3	-8.1	1.2	-11.2	-10.1	1.1	-1.2	±5.0, ∞
判定	Passed			Pass				

6) 実効値指示誤差検査 波高率3のバースト信号に対して1.0dB以内

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

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

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

7) 自己雑音特性検査 Self-noise

RANGE : 20-80dB

RANGE : 20-80dB (Including Microphone value)	A特性	C特性	Z特性
規格 Standard (dB)	22以下 Below 22	30以下 Below 30	32以下 Below 32
自己雑音 Self-noise (dB)	18.7	28.7	29.6
判定	Passed	Pass	

- 3 -

発行日: 2021年3月16日

校正証明書

貴社名 株式会社 TCC

下記製品は、当社の作業規程に従って校正が行われていることを証明します。  
この校正に使用した標準器は、パナソニックシステムエンジニアリング株式会社、メーカー JEMCO (日本電気計測技術研究所)、JQA (日本品質保証機構) などを通じて  
国家標準、または NIST (National Institute of Standards and Technology)  
などにトレーサビリティがとれています。

管理番号 EMO-1 0013  
品名 デジタルマルチメータ  
型式 34401A  
製造番号 MY45039877  
校正年月日 2021年3月16日  
環境条件 温度 23°C 湿度 50%  
発行番号 202101351

使用標準器

管理番号	型式	製造番号	名称	有効期限
ST-031	5700A	4635001	マルチメータ	2021/10

〒561-0854 大阪府豊中市瑞穂町3丁目1番1号  
パナソニックシステムエンジニアリング株式会社  
OS設備部 校正サービス課  
校正証明書発行責任者 佐藤 信

試験・校正成績書  
( Calibration Report )

成績書番号 39710K

管理番号 (Control Number)	EMO-1 0013
品名 (Description)	デジタルマルチメータ
製造者 (Manufacturer)	Agilent Technologies
型式 (Model Number)	34401A
製造番号 (Serial Number)	MY45039877
依頼者 (Customer)	株式会社 アー
校正日 (Calibration Date)	2021年3月18日
温度 (Temperature)	23 °C
湿度 (Humidity)	50 %
校正者 (Calibrated by)	松嶋 宏幸
適合判定 (Judgement)	合格/Pass
承認者 (Approved by)	
備考	

標準器 (Standard)	型式	製造番号	名称
管理番号 (Control Number)	型式 (Model Number)	製造番号 (Serial Number)	名称 (Description)
ST-031	5700A	4635001	キャリブレータ

この成績書に記載する標準器は国家標準にトレーサブルである。

パナソニックF&Sエンジニアリング株式会社  
1 / 2

試験・校正成績書

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

DC V	V/V	標準入力	下限	測定値	上限	判定
Range		Input	Lower Limit	Measured Value	Upper Limit	Result
100 mV	100 mV	99.991 mV	100.000 0 mV	100.008 5 mV		PASS
1 V	0.2 V	0.199 985 V	0.199 988 V	0.200 015 V		PASS
1 V	0.4 V	0.399 977 V	0.399 988 V	0.400 023 V		PASS
1 V	0.6 V	0.599 969 V	0.599 988 V	0.600 031 V		PASS
1 V	0.8 V	0.799 961 V	0.799 988 V	0.800 039 V		PASS
1 V	1.0 V	0.999 953 V	0.999 985 V	1.000 047 V		PASS
1 V	-0.2 V	-0.200 015 V	-0.200 000 V	-0.199 985 V		PASS
1 V	-0.4 V	-0.400 023 V	-0.400 000 V	-0.399 977 V		PASS
1 V	-0.6 V	-0.600 031 V	-0.599 989 V	-0.599 969 V		PASS
1 V	-0.8 V	-0.800 039 V	-0.799 988 V	-0.799 961 V		PASS
1 V	-1.0 V	-1.000 047 V	-0.999 987 V	-0.999 953 V		PASS
10 V	10 V	9.999 90 V	9.999 89 V	10.000 40 V		PASS
100 V	100 V	99.994 9 V	100.000 2 V	100.005 1 V		PASS
1000 V	1000 V	999.945 V	999.994 V	1 000.055 V		PASS

AC V	V/V	標準入力	下限	測定値	上限	判定
Frequency	Range	Input	Lower Limit	Measured Value	Upper Limit	Result
400 Hz	100 mV	100 mV	99.990 0 mV	100.008 5 mV	100.010 0 mV	PASS
400 Hz	1 V	1 V	0.999 100 V	1.000 830 V	1.000 900 V	PASS
400 Hz	10 V	10 V	9.991 00 V	10.008 48 V	10.009 00 V	PASS
400 Hz	100 V	100 V	99.910 0 V	99.991 4 V	100.080 0 V	PASS
400 Hz	750 V	750 V	699.995 V	699.975 V	700.045 V	PASS

OHMS (4W)	V/V	標準入力	下限	測定値	上限	判定
	Range	Input	Lower Limit	Measured Value	Upper Limit	Result
	10 Ω	100 Ω	99.995 0 Ω	100.007 0 Ω	100.014 0 Ω	PASS
	1 kΩ	1 kΩ	0.999 890 kΩ	1.000 050 kΩ	1.000 110 kΩ	PASS
	10 kΩ	10 kΩ	9.998 90 kΩ	10.000 50 kΩ	10.001 10 kΩ	PASS
	100 kΩ	100 kΩ	99.989 0 kΩ	100.008 7 kΩ	100.011 0 kΩ	PASS
	1 MΩ	1 MΩ	0.999 890 MΩ	1.000 033 MΩ	1.000 110 MΩ	PASS
	10 MΩ	10 MΩ	9.998 90 MΩ	9.998 69 MΩ	10.004 10 MΩ	PASS
	100 MΩ	100 MΩ	99.180 0 MΩ	100.797 8 MΩ	100.810 0 MΩ	PASS

DO 1						
V/V		標準入力	下限	測定値	上限	判定
Range		Input	Lower Limit	Measured Value	Upper Limit	Result
10 mA	10 mA		9.993 00 mA	9.999 18 mA	10.007 00 mA	PASS
100 mA	100 mA		99.945 0 mA	99.987 8 mA	100.065 0 mA	PASS
1 A	1 A		0.999 900 A	0.999 788 A	1.001 100 A	PASS
3 A	1 A		0.998 20 A	0.999 84 A	1.001 80 A	PASS

AC I	V/V	標準入力	下限	測定値	上限	判定
Frequency	Range	Input	Lower Limit	Measured Value	Upper Limit	Result
400 Hz	1 A	1 A	0.998 800 A	1.000 244 A	1.001 400 A	PASS
400 Hz	3 A	1 A	0.996 70 A	1.000 08 A	1.003 30 A	PASS

試験・校正成績書  
( Calibration Report )

成績書番号 39711K

校正証明書

発行日: 2021年3月18日

貴社名 株式会社 アー


下記製品は、当社の作業規程に従って校正が行われていることを証明します。  
この校正に使用した標準器は、パナソニックF&Sエンジニアリング株式会社、メーカー  
JEMO(日本電気計測検定所)、JQA(日本品質保証機構)などを通じて  
国家標準、またはJISST(National Institute of Standards and Technology)  
などにトレーサブルがとれています。

管理番号	EMO-1 0006
品名	可変抵抗減衰器
型式	STA-115
製造番号	11076
校正年月日	2021年3月18日
環境条件	温度 23°C 湿度 50%
発行番号	202101355

使用標準器

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

〒561-0854 大阪府豊中市瑞穂町3丁目1番1号  
パナソニックF&Sエンジニアリング株式会社  
CS統括部 校正サービス課  
校正証明書発行責任者 佐藤 啓介

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

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

この成績書に記載する標準器は国家標準にトレーサブルである。

パナソニックF&Sエンジニアリング株式会社  
1 / 2

型式 STA-116 製造番号 11075 管理番号 EMC-1 0006

調整速度/Adjustment speed						
周波数 f [Hz]	Δf/Hz	Δf/kHz	下限 Lower Limit	校正値 Calibration Value	上限 Upper Limit	判定 Result
1 kHz	0.1 dB	0.0 dB	0.05 dB	0.00 (0.0%) dB	0.15 dB	PASS
1 kHz	0.1 dB	0.1 dB	0.10 dB	0.10 dB	0.25 dB	PASS
1 kHz	0.1 dB	0.2 dB	0.15 dB	0.20 dB	0.35 dB	PASS
1 kHz	0.1 dB	0.3 dB	0.20 dB	0.30 dB	0.45 dB	PASS
1 kHz	0.1 dB	0.4 dB	0.25 dB	0.40 dB	0.55 dB	PASS
1 kHz	0.1 dB	0.5 dB	0.30 dB	0.50 dB	0.65 dB	PASS
1 kHz	0.1 dB	0.6 dB	0.35 dB	0.60 dB	0.75 dB	PASS
1 kHz	0.1 dB	0.7 dB	0.40 dB	0.70 dB	0.85 dB	PASS
1 kHz	0.1 dB	0.8 dB	0.45 dB	0.80 dB	0.95 dB	PASS
1 kHz	0.1 dB	0.9 dB	0.50 dB	0.90 dB	1.05 dB	PASS
1 kHz	0.1 dB	1.0 dB	0.55 dB	1.00 dB	1.10 dB	PASS
1 kHz	1 dB	1 dB	0.90 dB	1.00 dB	2.10 dB	PASS
1 kHz	1 dB	2 dB	1.30 dB	2.00 dB	3.10 dB	PASS
1 kHz	1 dB	3 dB	2.50 dB	3.01 dB	4.10 dB	PASS
1 kHz	1 dB	4 dB	4.00 dB	4.01 dB	5.10 dB	PASS
1 kHz	1 dB	5 dB	4.80 dB	5.01 dB	6.10 dB	PASS
1 kHz	1 dB	6 dB	5.80 dB	6.01 dB	7.10 dB	PASS
1 kHz	1 dB	7 dB	6.50 dB	7.01 dB	8.10 dB	PASS
1 kHz	1 dB	8 dB	7.50 dB	8.01 dB	9.10 dB	PASS
1 kHz	1 dB	9 dB	8.80 dB	9.01 dB	10.10 dB	PASS
1 kHz	1 dB	10 dB	8.80 dB	10.00 dB	10.30 dB	PASS
1 kHz	10 dB	10 dB	9.70 dB	10.02 dB	10.30 dB	PASS
1 kHz	10 dB	20 dB	19.90 dB	19.99 dB	20.30 dB	PASS
1 kHz	10 dB	30 dB	29.70 dB	29.97 dB	30.30 dB	PASS
1 kHz	10 dB	40 dB	39.70 dB	40.04 dB	40.30 dB	PASS
1 kHz	10 dB	60 dB	46.70 dB	50.08 dB	60.30 dB	PASS
1 kHz	10 dB	80 dB	56.70 dB	60.07 dB	80.30 dB	PASS
1 kHz	20 dB	40 dB	39.70 dB	40.07 dB	40.30 dB	PASS

パナソニックFSエンジニアリング株式会社  
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## 校正證明書

執行日：2021年3月18日

貴社名 株式会社 万一

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

管	理	番	号	EMC-1 0008
品		名		周波数カウンタ
型		式		VP-4545A
製	造	号		700008E122
技	正	年	月	2021年3月18日
環	境	条	件	温度 23℃ 湿度 60%
検	行	号		202101454

### 使用標準器

管理番号	型 式	製造番号	名 称	有効期限
EO-030	FT-001S	1504010018	時間間波数速隔校正装置	2021/8
EO-037	33250A	MY40005937	77777777777777777777	2021/8

〒561-0854 大阪府豊中市稻津町3丁目1番1号  
 パナソニックF&Sエンジニアリング株式会社  
 CS統括部 校正サービス課  
 校正証明書発行責任者 佐藤 信雄


## 試驗・校正成績書

( Calibration Report )

成績番号 39712K

管理番号 (Control Number)	EMC-I 0005
品名	周波数計 2727
製造者 (Manufacturer)	Frequency Counter
型式 (Model Number)	Panasonic
製造番号 (Serial Number)	VP-4545A
依頼者 (Customer)	700008E122
	株式会社 T-3

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

備考

## 標準器 (Standard)

管理番号 (Control Number)	型式 (Model Number)	製造番号 (Serial Number)	名称 (Description)
EO-030	FT-001S	1504010016	時間周波数選隔校正装置
EO-037	32350A	MY40005937	ファンクションエレータ

この成績書に記載する標準器は国家標準にトレーサブルである。

パナソニックFSエンジニアリング株式会社  
1/2

## 試驗・校正成績書

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

入力感度試験/Sensitivity (1kHz)

入力値 / INPUT LEVEL	入力値 / INPUT LEVEL	OK/NG	判定 / Result
INPUT A	50 offrms	OK	PASS
INPUT A (ノイズスケール)	25 offrms	OK	PASS
INPUT B	60 offrms	OK	PASS

基準時間確度試験/Timabase

194 H		測定値 Measured Value		上限 Upper Limit		判定 Result
下限 Lower Limit						
量 基準	10 MHz	9.999 50 MHz	10.000 00 MHz	10.000 60 MHz		PASS
<input type="checkbox"/> OPT 57	10 MHz	9.999 950 MHz	10.000 MHz	10.000 050 MHz		N/A
<input type="checkbox"/> OPT 27	10 MHz	9.999 980 MHz	10.000 MHz	10.000 020 MHz		N/A

## 二、讀點作

Item No.	Qty	Unit	Rate	Amount
DISPLAY	OK			PASS
ATT	OK			PASS
TEST	OK			PASS
Other measurement functions	OK			PASS

パナソニックFSエンジニアリング株式会社  
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証明番号: Y1557  
発行年月日: 2021年3月18日

### 校正証明書

依頼者: 株式会社アコー  
製品名: オーディオアナライザ  
型式名: VP-7721A  
製造番号: 482531D125  
校正実施日: 2021年3月18日

上記の計測器は当社の作業標準に従って校正・試験を行い、校正作業に於ける検査または試験の結果が仕様を満足していることを証明します。  
この校正・試験に使用された標準器は、日本電気計器検定所(JEMIC)、及び日本品質保証機構(JQA)など日本の公的校正機関、または米国国立標準技術研究所(NIST)など国際標準化機関に加盟している海外の公的校正機関に対してトレーサビリティが保たれております。  
また、一部の測定は直接標準器もしくは公差標準器にトレーサビリティを有しております。

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

使用標準器

型式名	製造番号	製品名	有効期限
5700A	5745305	マルチファンクショナル校正器	2021年05月
3458A	US28027685	デジタルマルチメータ	2021年05月
53132A	MF40002181	デジタルマルチメータ	2021年05月
VP-7722A	590019A122	オーディオアナライザ	2021年05月
AC-12B	H-6112204	電圧計校正器	2021年05月
HG-443B	H-66748	インテリジェントリレー	2021年05月

山脇電子工業株式会社  
Yamawaki Electronics Industry Co., Ltd.  
〒151-0072 東京都渋谷区松涛1-21-7 TEL: 03-3465-2421

試験成績書  
総数 3 枚中 1 枚  
管理番号: YD-210308

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

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

判定: 合格

試験の結果は、下記であることを証明します。  
この校正に際する測定は、国家標準にトレーサビリティが保たれています。

試験項目	規格	測定点	測定値	判定		
周波数	±3%以内 (全範囲) ±2%以内 (0.16 kHz~15.99 kHz)	周波数	測定値	判定		
出力範囲	±0.5 dB (4 dB~-35.9 dB) ±0.8 dB (-35 dB以下)	10 Hz	10.13 Hz	良		
		20 Hz	20.25 Hz	良		
		50 Hz	50.55 Hz	良		
		400 Hz	404.17 Hz	良		
		1 kHz	1.01 kHz	良		
		20 kHz	20.021 kHz	良		
		50 kHz	50.014 kHz	良		
		100 kHz	99.856 kHz	良		
		フラットネス	1 kHz 基準 ±0.3 dB (全範囲) ±0.1 dB (20 Hz~20 kHz)	出力	測定値	判定
				4.0 dB	3.93 dB	良
1.5 dB	1.43 dB			良		
-1.0 dB	-1.09 dB			良		
-3.5 dB	-3.58 dB			良		
-6.0 dB	-6.03 dB			良		
-16.0 dB	-16.03 dB			良		
-35.9 dB	-35.87 dB			良		
-36.0 dB	-36.05 dB			良		
-75.9 dB	-75.81 dB			良		

試験成績書  
総数 3 枚中 2 枚  
管理番号: YD-210308

試験項目	規格	測定点	測定値	判定			
周波数	±3%以内 (全範囲) ±2%以内 (0.16 kHz~15.99 kHz)	周波数	測定値	判定			
ひずみ率	±0.3% (全範囲) ±0.005% (30 Hz~49.9 kHz, 20 kHz~39.9 kHz) ±0.002% (50 Hz~19.99 kHz, 80 kHz BW)	10 Hz	0.00147 %	良			
		20 Hz	0.00150 %	良			
		50 Hz	0.00108 %	良			
		400 Hz	0.00031 %	良			
		1 kHz	0.00029 %	良			
		20 kHz	0.00093 %	良			
		50 kHz	0.00153 %	良			
		100 kHz	0.00419 %	良			
		AC/DC 線形	UNBAL	レンジ	入力電圧	測定値	判定
				100 V	100.0 V	100.1 V	良
30 V	30.00 V			29.94 V	良		
10 V	10.00 V			10.05 V	良		
3 V	3.000 V			3.004 V	良		
1 V	1.000 V			1.001 V	良		
300 mV	300.0 mV			300.3 mV	良		
100 mV	100.0 mV			99.8 mV	良		
30 mV	30.00 mV			29.97 mV	良		
10 mV	10.00 mV			10.02 mV	良		
フラットネス	1 kHz 基準 ±0.5 dB (20 Hz~100 kHz) ±3 dB (5 Hz~500 kHz)	レンジ	入力電圧	測定値	判定		
		100 V	100.0 V	100.1 V	良		
		30 V	30.00 V	29.94 V	良		
		10 V	10.00 V	10.05 V	良		
		3 V	3.000 V	3.004 V	良		
		1 V	1.000 V	1.001 V	良		
		300 mV	300.0 mV	300.3 mV	良		
		100 mV	100.0 mV	99.8 mV	良		
		30 mV	30.00 mV	29.97 mV	良		
		10 mV	10.00 mV	10.02 mV	良		

試験成績書  
総数 3 枚中 3 枚  
管理番号: YD-210308

試験項目	規格	測定点	測定値	判定	
周波数	±3%以内 (全範囲) ±2%以内 (0.16 kHz~15.99 kHz)	周波数	測定値	判定	
ひずみ率	±0.3% (全範囲) ±0.005% (30 Hz~49.9 kHz, 20 kHz~39.9 kHz) ±0.002% (50 Hz~19.99 kHz, 80 kHz BW)	レンジ	入力電圧	測定値	判定
		100 V	100.0 V	100.1 V	良
		30 V	30.00 V	29.94 V	良
		10 V	10.00 V	10.05 V	良
		3 V	3.000 V	3.004 V	良
		1 V	1.000 V	1.001 V	良
		300 mV	300.0 mV	300.3 mV	良
		100 mV	100.0 mV	99.8 mV	良
		30 mV	30.00 mV	29.97 mV	良
		10 mV	10.00 mV	10.02 mV	良

## 校正結果

## 音圧感度レベル

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

## 校正の不確かさ(k=2):

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

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



## 校正条件

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

## 特記事項

校正品の受取後、修理及び調整を行わず校正を実施した。

以上

総数 2頁の1頁  
証明書番号 1351-01114

校正証明書

依頼者 株式会社 アコー  
住所 東京都世田谷区代沢2-6-10  
品名 標準マイクロホン  
型式 4160  
製造番号 2973383  
製造者 Brüel & Kjær

校正項目 音圧感度レベル  
校正方法 IEC 61094-2に準拠した相互校正法を用いた音圧絶対校正  
校正条件 別紙のとおり  
校正実施場所 東京都八王子市南大沢四丁目4番地4  
一般財団法人 日本品質保証機構 計量計測センター 計器検定部校正室  
校正年月日 2021年7月8日

校正結果は次頁以降のとおりであることを証明します。

2021年7月12日

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

この証明書は、計量法第14条第1項に基づきのものであり、特定標準器(国家標準)にトレーサブルな標準器により校正した結果を示すものです。  
書面による承認なしに、この証明書のカラーコピー及び一部分のみを複製して使用することを禁じます。  
当センターは、ISO/IEC 17025:2017に基づく校正機関として認定されています。

## Certificate of System Qualification

GC-OQ + GCMS-OQ

System ID: CN10530014  
Organization Name: S.P.S. Consulting Service Co., Ltd  
Organization Location: 7 Sol Paholyothin 24 Bangkok 10900

Date: September 8, 2021 11:48 04 AM  
EQP Name: AgilentRecommended, AgilentRecommended  
EQP Revision: GC.02.51, GCMS.02.51  
Overall Qualification Status: Pass

## System Inspection and Basic Safety and Operation

Name 6890  
Setpoint Status: Pass

## Overall System Inspection and Basic Safety and Operation Test Status

Pass

## Inlet Pressure Decay

Name 6890  
Front SSL  
Setpoint Status: Pass  
Pressure: 25.0 psi  
Pressure Change: -0.1 psi /5 minutes  
Agilent Recommended: >= -2.0 and <= 0.5

## Overall Inlet Pressure Decay Test Status

Pass

## Inlet Pressure Accuracy

Name 6890  
Front SSL

Date: September 8, 2021 11:48:04 AM  
System ID: CN10530014

Setpoint Status: Pass  
Setpoint Actual  
Inlet Pressure: 25.0 psi 24.8 psi  
Accuracy: 0.1 psi  
Agilent Recommended: <= 1.2

## Overall Inlet Pressure Accuracy Test Status

Pass

## Inlet Pressure Accuracy

Name: 6890  
Back SSL  
Setpoint Status: Pass  
Setpoint Actual  
Inlet Pressure: 25.0 psi 25.0 psi  
Accuracy: 0.0 psi  
Agilent Recommended: <= 1.2

## Overall Inlet Pressure Accuracy Test Status

Pass

## Detector Flow Accuracy

Name: 6890  
Front FID  
Setpoint Status: Pass  
Flow Type: Fuel  
Setpoint: 30.0 mL/min Measured Flow: 30.8 mL/min  
Accuracy: 0.8 mL/min  
Agilent Recommended: <= 10.0 % setpoint ( 3.0 mL/min )  
Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.



Setpoint Status: Pass

Flow Type: Orisizer

Setpoint: 400.0 mL/min Measured Flow: 401.8 mL/min

Accuracy: 1.6 mL/min

Agilent Recommended:  $\leq 10.0$  % setpoint ( 40.0 mL/min )

Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

Setpoint Status: Pass

Flow Type: Makeup

Setpoint: 25.0 mL/min Measured Flow: 25.7 mL/min

Accuracy: 0.7 mL/min

Agilent Recommended:  $\leq 10.0$  % setpoint ( 2.5 mL/min )

Limit is percentage of setpoint or 0.5 mL/min, whichever is largest.

## Overall Detector Flow Accuracy Test Status

Pass

## GC Oven Temperature Accuracy

Name: 6890

Setpoint Status: Pass

Zone: Oven

Setpoint/Actual: 230.0 230.5 °C

Temperature: 230.0 230.5 °C

Accuracy: 0.5 °C

Agilent Recommended:  $\geq -1.0$  % setpoint in K ( -5.0 °C )

$\leq 1.0$  % setpoint in K ( 5.0 °C )

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Setpoint Status: Pass

Zone: Oven

Setpoint/Actual: 100.0 100.1 °C

Temperature: 100.0 100.1 °C

Accuracy: 0.1 °C

Agilent Recommended:  $\geq -1.0$  % setpoint in K ( -3.7 °C )

$\leq 1.0$  % setpoint in K ( 3.7 °C )

## Overall GC Oven Temperature Accuracy Test Status

Pass

## GC Oven Temperature Stability

Name: 6890

Setpoint Status: Pass

Setpoint/Average: 100.0 100.1 °C

Temperature: 100.0 100.1 °C

Stability: 0.0 °C

Agilent Recommended:  $\leq 0.5$  °C

## Overall GC Oven Temperature Stability Test Status

Pass

## Scouting Run

Tested Combination1: Front SSL / Front FID

Name: Injection Tower 7683B

Setpoint Status: Completed

Injection Volume on Column: 1.0 µL

## Overall Scouting Run Status

Completed

## Noise and Drift

Tested Combination1: Front SSL / Front FID

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Name: 6890

Setpoint Status: Pass

Base Signal: 20.2 pA

ASTM Noise: 521.58 counts

Drift: 193.20 counts/hr

Agilent Recommended:  $\leq 768.00$  counts

Status: Pass

Pass

## Overall Noise and Drift Test Status

Pass

## Injection Precision

Tested Combination1: Front SSL / Front FID

Name: 7683B

Setpoint Status: Pass

Injection Volume on Column: 1.0 µL

Area RSD: 0.41 %

Retention Time RSD: 0.13 %

Agilent Recommended:  $\leq 3.00$  %

## Overall Injection Precision Test Status

Pass

## Signal to Noise

Tested Combination1: Front SSL / Front FID

Name: Injection Tower 6890

Setpoint Status: Pass

Signal to Noise: 1019653

Agilent Recommended:  $\geq 300000$

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## Overall Signal to Noise Test Status

Pass

## Log Amp

Tested Combination2: Back SSL / External SQ

Name: 5975C

Setpoint Status: Pass

## Overall Log Amp Test Status

Pass

## RPPA

Tested Combination2: Back SSL / External SQ

Name: 5975C

Setpoint Status: Pass

Amu: 1050 m/z

Drift After Five Minutes: 10 mV

RPPA Voltage: 498 mV

Agilent Recommended:  $\geq -100$  and  $\leq 100$  mV

## Overall RPPA Test Status

Pass

## Tune EI

Tested Combination2: Back SSL / External SQ

Name: 5975C

Setpoint Status: Pass

Filament: 1

Setpoint Status: Pass

Filament: 2

## Overall Tune EI Test Status

Pass

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## Signal to Noise EI

Tested Combination2 Back SSL / External SQ

Name: 5975C

Source: EI - Inert Filament 1

Setpoint Status: Pass

Signal to Noise: 600

Agilent Recommended: &gt;= 160

Source: EI - Inert Filament 2

Setpoint Status: Pass

Signal to Noise: 288

Agilent Recommended: &gt;= 160

This test's 0 comment(s) and 2 deviation(s) are available in the Attachments section

Overall Signal to Noise EI Test Status

Pass

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## Instrument Details

## Purpose

This section describes the as found system configuration

## Details

## System

System ID	CN10630014
Manufacturer	Agilent Technologies
Name	6890
Flow Data Input	Manual Data
Temperature Data Input	Manual Data or Other Data Logging

## Tested Combination1

Injection Technique	Injection Tower
Inlet	Front
Detector	Front
LTM Included?	No

## Tested Combination2

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

## Sampler 1

Manufacturer	Agilent Technologies
Type	Injection Tower
Name	7633B
Model Number	G2013A
Serial Number	CN64136101
Usage	Sample Injection
Location	Front
Syringe Volume (µL)	10

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## Sampler 2

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

## Mainframe 1

Manufacturer	Agilent Technologies
Name	6890
Model Number	G1530N
Serial Number	CN10630014
Firmware Revision	N.02.01
Oven Type	Standard

## Inlet 1

Manufacturer	Agilent Technologies
Name	6890
Type	SSL
Location	Front
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

## Inlet 2

Manufacturer	Agilent Technologies
Name	6890
Type	SSL
Location	Back
Carrier Gas	Helium
Control Type	Electronic Pressure Control (EPC)
Purged Inlet	Yes

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## Detector 1

Manufacturer	Agilent Technologies
Name	Mass Spectrometer
Type	Mass Spectrometer
Location	External

## Detector 2

Manufacturer	Agilent Technologies
Name	6890
Type	FID
Adapter	Capillary
Control Type	Electronic Pressure Control (EPC)
Location	Front
Makeup Gas	Nitrogen

## Mass Spectrometer 1

Manufacturer	Agilent Technologies
Type	SQ
Name	5975C
Serial Number	US61833454
Firmware Revision	5.02.04
High Vacuum System	Turbo Pump
Sourcing Run Standard	OFN Std

## MS EI Source 1

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

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## Purpose

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Signature Creation Date:	September 8, 2021
Reason for Signature:	Executed protocol and published this original version of document

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System ID: CH10830014

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EPS\_OQOCME Transactions Log

Type	Transaction Date	Activity Performed	Type of Transaction	Optional Information
September 7, 2021 2:28:30 PM	Auth	Session Created	Session	None
September 7, 2021 2:35:30 PM	Start	Configuration	Session	None
September 7, 2021 2:28:30 PM	Auth	Encryption	Licenseing	User is PublicPrinter and does not require an unlock code
September 7, 2021 3:12:18 PM	Auth	Encrypted	Session	<p>EQP details for primary technique [OC] - File path: <a href="#">C:\ProgramData\Gigamon\Conf\Gigamon\eqp\EQP\OC\02.01.aq5</a></p> <p>EQP File Name: [OC.02.01.aq5], EQP Name: [AlphaNotRecommended]</p> <p>EQP details for hypochlorinated technique [Oclic] - File path: <a href="#">C:\ProgramData\Gigamon\Conf\Gigamon\eqp\EQP\Oclic\02.01.aq5</a></p> <p>EQP File Name: [Oclic.02.01.aq5], EQP Name: [AlphaNotRecommended]</p>
September 7, 2021 3:12:28 PM	Auth	Configuration	Session	None
September 7, 2021 3:12:30 PM	Start	Configuration	Backend	OC
September 7, 2021 3:12:30 PM	Start	Execution	System Inspection and Basic Safety and Operation - 0600 - Qualitative Test - No actions associated	None

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System ID: CN10630014

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User Name: admin@redhat.com      System Id: CMT0000014  
Host Name: DCENT001-SERV004      Print Date: September 8, 2021 11:48:00 AM

**SEE CROSS-REFERENCE PAGE 3**

688 COOCHIN TRANSACTIONS

**SEE CROSS-REFERENCE PAGE 3**

Time	Transaction Start	End	Activity Performed	Type of Transaction	Optional Information
September 7, 2021 2:12:48 PM			Execution	System Injection and Basic Logging into Operation - 4090 + Qualitative Test - No symptoms associated	Run Count: 1
September 7, 2021 2:13:47 PM			Execution	GC Booting Run - Injection Tower, Front SBL, Front FID - Part of System Preparation - No tests associated	None
September 7, 2021 3:00:16 PM			Execution	GC Booting Run - Injection Tower, Front SBL, Front FID - Part of System Preparation - No tests associated	None
September 7, 2021 3:40:29 PM			Execution	Inlet Pressure Drift - Front SBL - Pressure Controlled test - 0.25.0 psi - L = -0.0 psi and = 0.3 psi	None
September 7, 2021 3:40:38 PM			Execution	Inlet Pressure Drift - Front SBL - Pressure Controlled test - 0.25.0 psi - L = -0.0 psi and = 0.3 psi	Run Count: 1
September 7, 2021 3:40:41 PM			Execution	Inlet Pressure Accuracy - Front SBL - Pressure Controlled test - 0.25.0 psi - L = 1.2 psi	None
September 7, 2021 3:40:48 PM			Execution	Inlet Pressure Accuracy - Front SBL - Pressure Controlled test - 0.25.0 psi - L = 1.2 psi	Run Count: 1
September 7, 2021 3:40:49 PM			Execution	Inlet Pressure Accuracy - Back SBL - Pressure Controlled test - 0.25.0 psi - L = 1.2 psi	None
September 7, 2021 3:40:53 PM			Execution	Inlet Pressure Accuracy - Back SBL - Pressure Controlled test - 0.25.0 psi - L = 1.2 psi	Run Count: 1

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Date: September 8, 2021 11:48:04 AM  
System ID: CRI10830014

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User Name: admin@redhat.com System ID: CR1043004  
Print Date: September 8, 2024 11:02:06 AM

899 0502010 Transaction fee

Time	Transaction State	Activity/Parameter	Type of Transaction	Optional Information
September 7, 2021 8:40:55 AM PST	Initiation		Detecter Flow Accuracy - Front FID - Type : Fuel - S: 30.0 m/s/min - L: ~ 10.0% wetpoint	None
September 7, 2021 8:41:11 AM PST	Data		Detecter Flow Accuracy - Front FID - Type : Fuel - S: 30.0 m/s/min - L: ~ 10.0% wetpoint	Manual Data Entry
September 7, 2021 8:41:16 AM PST	Execution		Detecter Flow Accuracy - Front FID - Type : Fuel - S: 30.0 m/s/min - L: ~ 10.0% wetpoint	Run Count: 1
September 7, 2021 8:41:18 AM PST	Execution		Detecter Flow Accuracy - Front FID - Type : Outflow - S: 400.0 m/s/min - L: ~ 10.0% wetpoint	None
September 7, 2021 8:41:54 AM PST	Data		Detecter Flow Accuracy - Front FID - Type : Outflow - S: 400.0 m/s/min - L: ~ 10.0% wetpoint	Manual Data Entry
September 7, 2021 8:41:56 AM PST	Execution		Detecter Flow Accuracy - Front FID - Type : Outflow - S: 400.0 m/s/min - L: ~ 10.0% wetpoint	Run Count: 1
September 7, 2021 8:41:58 AM PST	Execution		Detecter Flow Accuracy - Front FID - Type : Makeup - S: 25.0 m/s/min - L: ~ 10.0% wetpoint	None
September 7, 2021 8:41:59 AM PST	Data		Detecter Flow Accuracy - Front FID - Type : Makeup - S: 25.0 m/s/min - L: ~ 10.0% wetpoint	Manual Data Entry
September 7, 2021 8:41:59 AM PST	Execution		Detecter Flow Accuracy - Front FID - Type : Makeup - S: 25.0 m/s/min - L: ~ 10.0% wetpoint	Run Count: 1
September 7, 2021 8:41:59 AM PST	Execution		GC Oven Temperature Accuracy - BPC - Temperature : Oven - S: 230.0°C - L: ~ +/- 0.5 MSO ~ 1.0 % wetpoint in K	None

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Date: September 8, 2021 11:45:04 AM  
System ID: CN10536014

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User Name: admin_rms@edwinj		System ID: CN19830514		
Host Name: DESKTOP-88MTV889		Print Date: September 8, 2021 11:46:06 AM		
SPR_OGGCM9 Transaction Log :				
Time	Transaction State	Activity Performed	Optional Information	
September 7, 2021 3:43:08 AM	Auto	Date	GC Oven Temperature Accuracy - 8800 - Temperature Oven - S: 230.0°C - L: >= +1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
September 7, 2021 3:42:18 PM	Executed	GC Oven Temperature	Accuracy - 8800 - Temperature Oven - S: 230.0°C - L: >= +1.0 AND <= 1.0 % setpoint in K	Run Count: 1
September 7, 2021 3:42:13 PM	Executed	GC Oven Temperature	Accuracy - 8800 - Temperature Oven - S: 100.0°C - L: >= +1.0 AND <= 1.0 % setpoint in K	None
September 7, 2021 3:42:34 AM	Auto	Date	GC Oven Temperature Accuracy - 8800 - Temperature Oven - S: 100.0°C - L: >= +1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
September 7, 2021 3:42:38 PM	Executed	GC Oven Temperature	Accuracy - 8800 - Temperature Oven - S: 100.0°C - L: >= +1.0 AND <= 1.0 % setpoint in K	Run Count: 1
September 7, 2021 3:42:58 PM	Auto	GC Oven Temperature Stability	Accuracy - 8800 - Temperature Oven - S: 100.0°C - L: >= +1.0 AND <= 1.0 % setpoint in K	None
September 7, 2021 3:43:34 AM	Auto	Date	GC Oven Temperature Stability Accuracy - 8800 - Temperature Oven - S: 100.0°C - L: >= +1.0 AND <= 1.0 % setpoint in K	Manual Data Entry
September 7, 2021 3:43:37 PM	Executed	GC Oven Temperature Stability	Accuracy - 8800 - Temperature Oven - S: 100.0°C - L: >= +1.0 AND <= 1.0 % setpoint in K	Run Count: 4
September 7, 2021 3:43:53 PM	Executed	GC Sampling Rate - Injector Tuner, From 93 - Freq 730 - Part of System Presentation - No Inlets associated		None

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System ID: CN10630014

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Time	Transaction Start	Activity Performed	Type of Transaction	Operational Information
September 7, 2021 3:46:05 AM	Start PM	Start	DC Solenoid Run - Injection	Data Run Path: R:\MSDC\DC\20210907\DCM
September 7, 2021 3:44:56 AM	End PM	Evacuation	DC Solenoid Run - Injection Tower, Front BSL, Front FID - Part of System Preparation - No Arise associated	Run Count: 1
September 7, 2021 3:48:41 AM	Start PM	Execution	Arise and Drift - Front FID - Detector FID - L (Noise) => 0.10 pA - L (Drift) => 2.9C pA/hour	None
September 7, 2021 3:47:00 AM	Start PM	Data	House and Drift - Front FID - Detector FID - L (Noise) => 0.10 pA - L (Drift) => 2.60 pA/hour	Data Run Path: R:\MSDC\DC\20210907\DCM
September 7, 2021 3:47:51 AM	End PM	Qualification	Stabilize	OO
September 7, 2021 3:47:51 AM	Start PM	Configuration	Baseline	None
September 7, 2021 3:48:48 AM	End PM	Configuration	Baseline	None
September 7, 2021 3:49:43 AM	Start PM	Qualification	Stabilize	OO
September 7, 2021 3:48:48 AM	Start PM	Execution	House and Drift - Front FID - Detector FID - L (Noise) => 0.10 pA - L (Drift) => 2.80 pA/hour	None
September 7, 2021 3:49:02 AM	End PM	Execution	House and Drift - Front FID - Detector FID - L (Noise) => 0.10 pA - L (Drift) => 2.9C pA/hour	Run Count: 1

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Date: September 21, 2021 11:48:04 AM  
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Time	Transaction Date	Activity Performed	Type of Transmission	Optional Information
September 7, 2021 5:48:08 AM	Start PM	Exclusion	Injection: Precision - Injection Tower, Front SS, Front PID - GC - L (Area) == 2.50% - L (Rel. Time) == 1.00%	None
September 7, 2021 5:49:22 AM	Auto PM	Data	Injection Precision - Injection Tower, Front SS, Front PID - GC - L (Area) == 2.50% - L (Rel. Time) == 1.00%	Data Res Path: K:\SP\SOP\V2021\VAL\PREC 06.D\FID1A.CH
September 7, 2021 5:49:22 AM	Auto PM	Data	Injection Precision - Injection Tower, Front SS, Front PID - GC - L (Area) == 2.50% - L (Rel. Time) == 1.00%	Data Res Path: K:\SP\SOP\V2021\VAL\PREC 03.D\FID1A.CH
September 7, 2021 5:49:22 AM	Auto PM	Data	Injection Precision - Injection Tower, Front SS, Front PID - GC - L (Area) == 2.50% - L (Rel. Time) == 1.00%	Data Res Path: K:\SP\SOP\V2021\VAL\PREC 04.D\FID1A.CH
September 7, 2021 5:49:22 AM	Auto PM	Data	Injection Precision - Injection Tower, Front SS, Front PID - GC - L (Area) == 2.50% - L (Rel. Time) == 1.00%	Data Res Path: K:\SP\SOP\V2021\VAL\PREC 08.D\FID1A.CH
September 7, 2021 5:49:22 AM	Auto PM	Data	Injection Precision - Injection Tower, Front SS, Front PID - GC - L (Area) == 2.50% - L (Rel. Time) == 1.00%	Data Res Path: K:\SP\SOP\V2021\VAL\PREC 09.D\FID1A.CH
September 7, 2021 5:49:22 AM	Auto PM	Data	Injection Precision - Injection Tower, Front SS, Front PID - GC - L (Area) == 2.50% - L (Rel. Time) == 1.00%	Data Res Path: K:\SP\SOP\V2021\VAL\PREC 07.D\FID1A.CH
September 7, 2021 5:49:47 AM	End PM	Exclusion	Injection: Precision - Injection Tower, Front SS, Front PID - GC - L (Area) == 2.50% - L (Rel. Time) == 1.00%	Run Count: 1

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System ID: CN10030014

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User Name: sckey\_rstan@rhl

System ID: CVM650014

Host Name: DESKTOP-83667R8

Print Date: September 3, 2021 11:58:06 AM

SPB\_OSCILL TransAccess log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 7, 2021 3 48:51 PM	Start	Execution	Signal to Noise - Injection Tones, Freq 8SL, Freq FID - Detector FID - L = 300000	Name
September 7, 2021 3 50:05 AM	End	Data	Signal to Noise - Injection Tones, Freq 8SL, Freq FID - Detector FID - L = 300000	Onset Freq Part: C:\SPB\OCD\2021\6307001 BSI DFDIA1A.CH
September 7, 2021 3 50:22 PM	End	Execution	Signal to Noise - Injection Tones, Freq 8SL, Freq FID - Detector FID - L = 300000	Run Count: 1
September 7, 2021 3 50:32 PM	Start	Execution	Log Amp - 6875C SQ - Source	Name IS - Inert
September 7, 2021 3 50:54 PM	End	Execution	Log Amp - 6875C SQ - Source	Run Count: 1 IS - Inert
September 7, 2021 3 50:59 PM	Start	Execution	RFFA - 6875C SQ - Source	E Name - Inert
September 7, 2021 3 51:08 PM	End	Qualification	Session	OQ
September 7, 2021 3 51:05 PM	Start	Corruption	Session	Name
September 7, 2021 3 57:26 PM	End	Corruption	Session	Name
September 7, 2021 3 57:26 PM	Start	Qualification	Session	OQ
September 7, 2021 3 57:28 PM	Start	Execution	RFFA - 6875C SQ - Source	E Name - Inert
September 7, 2021 3 59:40 PM	End	Execution	RFFA - 6875C SQ - Source	Run Count: 1 - Inert
September 7, 2021 3 59:54 PM	Start	Execution	Tune IS - 6875C SQ - Source - Noise	IS - Inert IF Filtered 2 (Qualitative - Inert) (Inert) (Inert)

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Date: September 8, 2021 11:48:04 AM  
System ID: CH10630014

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User Name: admin@msd0014  
Host Name: DESKTOP-888TV86  
System ID: CH1030014  
Print Date: September 8, 2021 11:48:08 AM

SPL\_OOCCMS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 7, 2021 4:50:10 Start PM	Execution	Turn EI - 9675C SO - Source - None EI - Port Parameter 1 (Qualitative) - No sample(s) associated		
September 7, 2021 4:50:55 End PM	Execution	Turn EI - 9675C SO - Source - Run Count: 1 EI - Port Parameter 1 (Qualitative) - No sample(s) associated		
September 7, 2021 4:50:55 Start PM	Execution	Turn EI - 9675C SO - Source - None EI - Port Parameter 1 (Qualitative) - No sample(s) associated		
September 7, 2021 4:50:55 End PM	Execution	Turn EI - 9675C SO - Source - Run Count: 1 EI - Port Parameter 1 (Qualitative) - No sample(s) associated		
September 7, 2021 4:50:58 Start PM	Execution	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100		
September 7, 2021 4:51:55 Audit PM	Data	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100	Data File Path: K:\SP\OCCPV2021\SNF1_01.D\DATA.MS	
September 7, 2021 4:53:55 Audit PM	Data	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100	Data File Path: K:\SP\OCCPV2021\SNF1_02.D\DATA.MS	
September 7, 2021 4:55:44 Start PM	Execution	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 2 - L >= 100		
September 7, 2021 4:55:48 Audit PM	Data	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 2 - L >= 100	Data File Path: K:\SP\OCCPV2021\SNF2_01.D\DATA.MS	

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User Name: admin@msd0014  
Host Name: DESKTOP-888TV86  
System ID: CH1030014  
Print Date: September 8, 2021 11:48:08 AM

SPL\_OOCCMS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 7, 2021 4:56:56 End PM	Execution	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 2 - L >= 100		Run Count: 1
September 7, 2021 4:56:57 Start PM	Execution	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100		
September 7, 2021 4:56:58 Audit PM	Data	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100		Data File Path: K:\SP\OCCPV2021\SNF1_01.D\DATA.MS
September 7, 2021 4:58:01 Audit PM	Data	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100		Data File Path: K:\SP\OCCPV2021\SNF1_01.D\DATA.MS
September 7, 2021 4:58:29 Audit PM	Data	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100		Data File Path: K:\SP\OCCPV2021\SNF1_01.D\DATA.MS
September 7, 2021 4:58:50 Audit PM	Acquisition	Session		
September 7, 2021 4:58:57 Audit PM	Acquisition	Session		
September 7, 2021 4:59:48 Audit PM	Session/Release	Session		
September 7, 2021 4:59:50 Start PM	Qualification	Session		QC
September 7, 2021 4:59:53 Start PM	Execution	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100		

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Date: September 8, 2021 11:49:04 AM  
System ID: CH1030014

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Date: September 8, 2021 11:49:04 AM  
System ID: CH1030014

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User Name: admin@msd0014  
Host Name: DESKTOP-888TV86  
System ID: CH1030014  
Print Date: September 8, 2021 11:48:08 AM

SPL\_OOCCMS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 7, 2021 4:17:12 Audit PM	Data	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100	Data File Path: K:\SP\OCCPV2021\SNF1_02.D\DATA.MS	
September 7, 2021 4:17:21 Audit PM	Data	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100	Data File Path: K:\SP\OCCPV2021\SNF1_01.D\DATA.MS	
September 7, 2021 4:17:58 Audit PM	Data	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100	Data File Path: K:\SP\OCCPV2021\SNF1_01.D\DATA.MS	
September 7, 2021 4:19:10 Audit PM	Data	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100	Data File Path: K:\SP\OCCPV2021\SNF1_01.D\DATA.MS	
September 7, 2021 4:20:34 End PM	Execution	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100	Run Count: 1	
September 7, 2021 4:20:42 Audit PM	Test/Release	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100	Deviation Used for Run Count: 1	
September 7, 2021 4:20:42 Start PM	Execution	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100		
September 7, 2021 4:20:53 Audit PM	Data	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100	Data File Path: K:\SP\OCCPV2021\SNF1_01.D\DATA.MS	

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User Name: admin@msd0014  
Host Name: DESKTOP-888TV86  
System ID: CH1030014  
Print Date: September 8, 2021 11:48:08 AM

SPL\_OOCCMS Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 7, 2021 4:21:20 End PM	Execution	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100		Run Count: 2
September 7, 2021 4:21:58 Audit PM	Test/Release	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100		Deviation Used for Run Count: 2
September 7, 2021 4:21:58 Start PM	Execution	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100		
September 7, 2021 4:21:48 Audit PM	Data	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100	Data File Path: K:\SP\OCCPV2021\SNF1_01.D\DATA.MS	
September 7, 2021 4:22:25 Audit PM	Acquisition	Session		
September 7, 2021 4:22:37 Audit PM	Acquisition	Session		
September 7, 2021 4:23:58 Audit PM	Session/Release	Session		
September 7, 2021 4:24:00 Start PM	Qualification	Session		QC
September 7, 2021 4:24:03 Start PM	Execution	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100		
September 7, 2021 4:24:28 Audit PM	Data	Signal to Noise EI - Liquid Injection, Back SSI, SO - Source: EI - Inject using Filtered 1 - L >= 100	Data File Path: K:\SP\OCCPV2021\SNF1_01.D\DATA.MS	

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Date: September 8, 2021 11:48:04 AM  
System ID: CH1030014

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Date: September 8, 2021 11:48:04 AM  
System ID: CH1030014

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User Name: pcn\jstammert  
Host Name: DESKTOP-434E7V84System ID: CN1630014  
Print Date: September 8, 2021 11:48:09 AM

## SPS\_DQCCRE Transaction Log:

Time	Transaction State	Activity Performed	Type of Transaction	Optional Information
September 7, 2021 4:27:05 PM	Acq	Data	Signal to Noise E - Liquid Injection, Back SLS, SC - Source: E1 - Inert using Filament 1 - L1 = 150	Data File Path: K:\SPS-DQCCRE\SPS_F_001.D; DATA.MS
September 7, 2021 4:30:00 PM	End	Execution	Signal to Noise E1 - Liquid Injection, Back SLS, SC - Source: E1 - Inert using Filament 1 - L1 = 150	Raw Count: 0
September 7, 2021 4:38:10 PM	Acq	AcqClosed	Session	None
September 8, 2021 11:31:05 AM	Acq	AcqEntered	Session	None
September 8, 2021 11:31:07 AM	Acq	SessionPauses	Session	None
September 8, 2021 11:31:15 AM	Stat	QualMonitor	Session	QC
September 8, 2021 11:31:32 AM	End	QualMonitor	Session	QC
September 8, 2021 11:31:32 AM	Stat	Reporting	Session	None
September 8, 2021 11:48:01 AM	Acq	Reporting	Session	Report Date/Time: Cert/Case

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Date: September 8, 2021 11:48:04 AM  
System ID: CN1630014

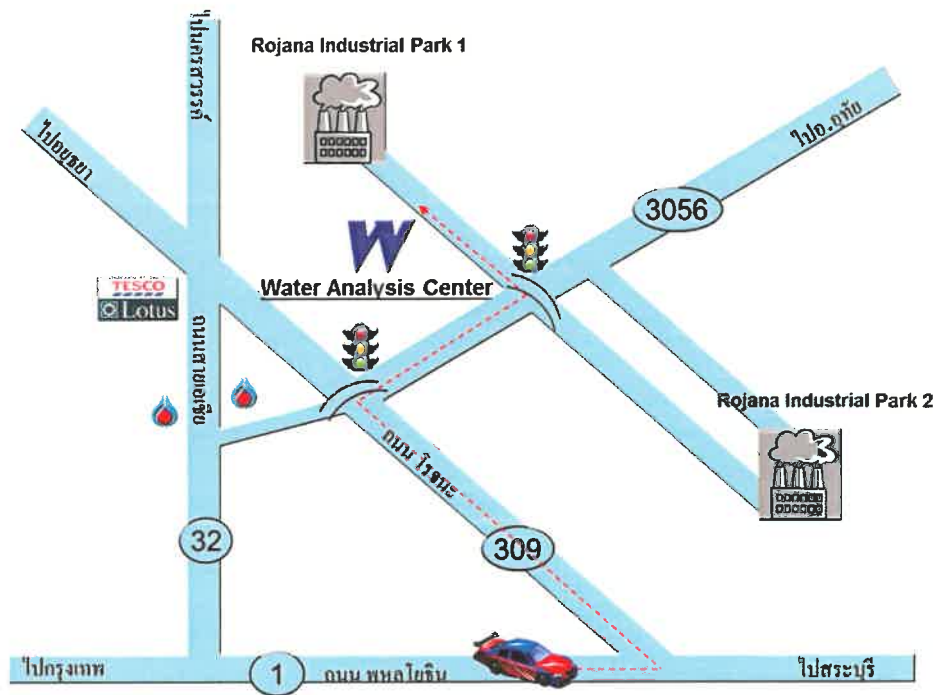
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บริษัท ศูนย์วิเคราะห์น้ำ จำกัด

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

โทรศัพท์ 035-800593, 081-9917119 โทรสาร 035-800594

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