

ภาคผนวกที่ 5
เอกสารสอบเทียบเครื่องมือตรวจวัด

ภาคผนวกที่ 5-1
เอกสารสอบเทียบเครื่องมือตรวจวัดคุณภาพอากาศ



JIRANATEE ASSOCIATES CO.,LTD.

Jiranatee Associates Co.,Ltd.
63/14-15, 67/35-36
Petchkasem 7,7/1, Rd. Watthapra, Bangkokyai,
Bangkok 10600(Thailand)
Tel: +6608680812
Mobile: +66863999453
E-mail: jnac-calibration@jiranatee.com
Web site: www.jiranatee.com

Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TISI-TIS 17025
CALIBRATION 0367

Flow measurement laboratory
Calibration services department.



CERTIFICATE OF CALIBRATION

Certificate No. : COF-017-67

Page 1 of 2 Pages

MEASUREMENT ITEM : Top Load Orifice
MANUFACTURER : TISCH
MODEL/TYPE : TE-5025A
SERIAL NUMBER : 710725
ID NUMBER : -
CONDITION AS-RECEIVED : Used item
CUSTOMER : Pacific Laboratory Co., Ltd.
14/5358 Moo14, T.Bang Bua Thong, A.Bang Bua Thong,
Nonthaburi 11110, Thailand.

RECEIVED DATE : 28 May 2024
MEASUREMENT DATE : 31 May 2024
ISSUE DATE : 31 May 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:

Temperature	: 23.0 ± 3.0	°C
Relative Humidity	: 55.0 ± 15.0	%RH
Atmospheric Pressure	: 1010 ± 10	hPa

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.
Measurement Condition : The average values during measurement are 23.1 °C and 50.4 %RH.

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

TABULATION OF RESULTS:

The table on next page give the measured values.

Calibration procedure:

The Orifice gas flow device was calibrated against Standard Rotary Displacement Meter (Roots Meter) Model G65/IMC/W2-dp. The WI-CL-004 was used as a calibration guideline.

Traceability:

This certificate provides a traceability of the measurement to recognized the national standards, and to realization of the international system of units (SI) through the NIMT (National Metrology Institute of Thailand) via Certificate number: MW-0063-23.

Uncertainty of Measurement:

The reported uncertainty of measurement is based on the standard uncertainty multiplied by a coverage factor $k=2$, Which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty has been determined in accordance with the GUM 'Evaluation of measurement data - Guide to the expression of uncertainty in measurement'

Calibrated by:

- ☒ Mr. Sorawit Thachalad
☐ Miss Jitraporn Lertsomphol



Approved signato

MEASUREMENT RESULTS:

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

Table 1: The results of Q Standard calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	$\Delta p_{Orifice}$ inH ₂ O	γ	Standard Flow [Q_s] m^3/min
1	0.702	752.536	23.17	22.37	49.860	1.691	1.298	0.655
2	1.002	752.502	23.34	22.68	63.856	3.329	1.821	0.915
3	1.110	752.584	23.41	22.80	42.943	4.353	2.082	1.044
4	1.167	752.462	23.62	22.97	32.314	4.956	2.220	1.113
5	1.423	752.441	23.74	23.07	29.684	7.471	2.725	1.362

Slope (m): **2.01598**
 Intercept (b): **-0.02301**
 Correlation coefficient (r): **0.99985**
 Uncertainty ($k=2$): **0.015** m^3/min

Table 2: The results of Q actual calibration data

Plate	Flow rate m^3/min	Pressure [Pa] mmHg	Temperature [Ta] °C	Temperature [Tm] °C	Δp_{meter} mmHg	$\Delta p_{Orifice}$ inH ₂ O	γ	Standard Flow [Q_s] m^3/min
1	0.702	752.536	23.17	22.37	49.860	1.691	0.816	0.657
2	1.002	752.502	23.34	22.68	63.856	3.329	1.145	0.919
3	1.110	752.584	23.41	22.80	42.943	4.353	1.310	1.049
4	1.167	752.462	23.62	22.97	32.314	4.956	1.398	1.119
5	1.423	752.441	23.74	23.07	29.684	7.471	1.717	1.370

Slope (m): **1.26266**
 Intercept (b): **-0.01445**
 Correlation coefficient (r): **0.99985**
 Uncertainty ($k=2$): **0.015** m^3/min

End of Certificate of Calibration



CALIBRATION TEST REPORT FOR Partisol Air Sampler

Calibrated Date: 25 September 2023
Calibrated Due on: 24 September 2024

Report No: PM-202309024

Instruments Information

Description : Thermo Scientific Partisol 2025i
Sequential Air Sampler

Model : 2025I

Sample flow control and reporting : 10 - 19 LPM

Serial No. : 2025I205661402

Instrument used for calibration [STD]

Description : Flow Meter

BIOS DryCal DC-Lite

Model : DCL-M REV. 1.08

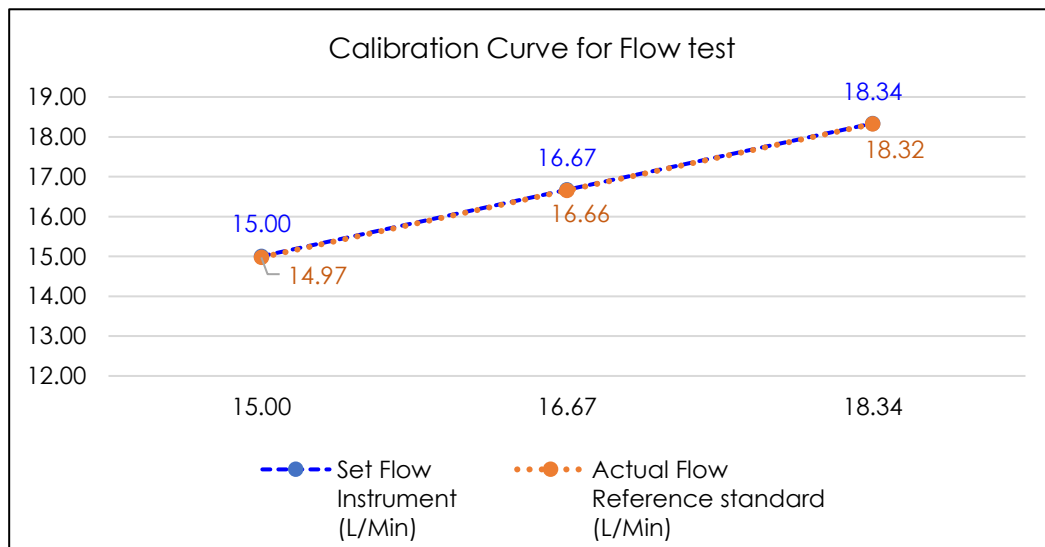
Range : 200 ml/min - 20 L/min

Serial No. : 5016

Environment : Temperature 25.5 °C Humidity: 51 %RH

Calibration Report

Filter	Set Flow Instrument (L/Min)	Current Flow Instrument reading (L/Min)	Actual Flow Reference standard (L/Min)	Error	Drift%
47 mm	15.00	15.00	14.97	-0.03	0.19
	16.67	16.67	16.66	-0.01	0.08
	18.34	18.34	18.32	-0.02	0.08



Calibrate By :

Approve by :

CALIBRATION TEST REPORT FOR Partisol Air Sampler

Calibrated Date: 22 September 2023
Calibrated Due on: 21 September 2024

Report No: PM-202309022

Instruments Information

Description : Thermo Scientific Partisol 2025i
Sequential Air Sampler

Model : 2025I

Sample flow control and reporting : 10 - 19 LPM

Serial No. : 2025I205851402

Instrument used for calibration [STD]

Description : Flow Meter

BIOS DryCal DC-Lite

Model : DCL-M REV. 1.08

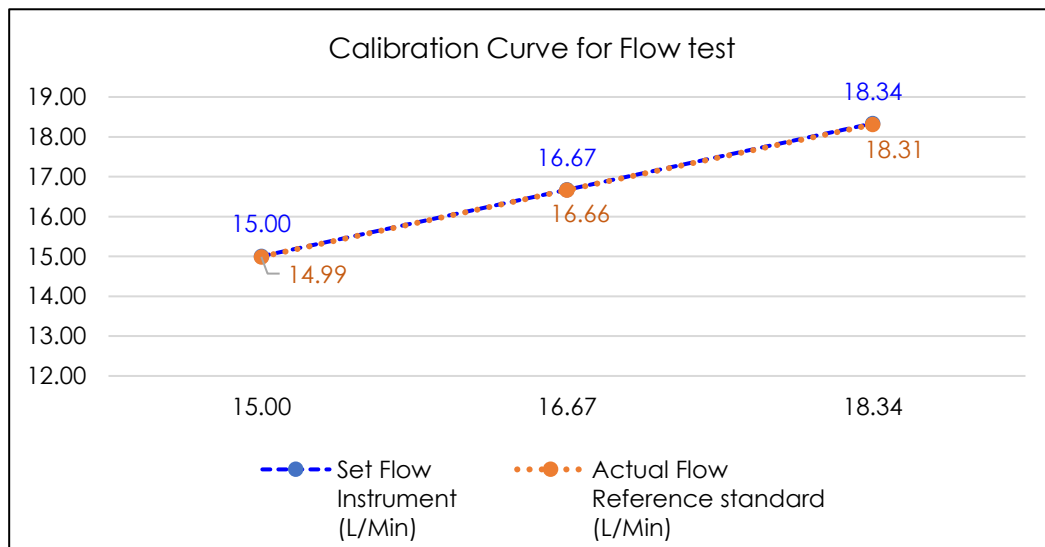
Range : 200 ml/min - 20 L/min

Serial No. : 5016

Environment : Temperature 25.5 °C Humidity: 51 %RH

Calibration Report

Filter	Set Flow Instrument (L/Min)	Current Flow Instrument reading (L/Min)	Actual Flow Reference standard (L/Min)	Error	Drift%
47 mm	15.00	15.00	14.99	-0.02	0.10
	16.67	16.67	16.66	-0.01	0.05
	18.34	18.34	18.31	-0.03	0.15



Calibrate By :

Approve by :

Certificate of Calibration

Certificate No. : 66-200247-2

Page : 1 of 2

Submitted by : Pacific Laboratory Co., Ltd.

14/5358 Moo 14, T.Bang Bua Thong, A.Bang Bua Thong, Nonthaburi 11110 Thailand

Equipment : Electronic Balance

Manufacturer : SHIMADZU

Model : AP225WD

Serial No. : D316301828

ID No. : LAB-BL-003

Capacity : 220 g

Resolution : 0.00001g/102g, 0.0001g/220g

Environment : On site calibration was carried out at the Laboratory, Pacific Laboratory Co., Ltd.

Ambient Temperature : (25.1 to 25.4) °C

Relative Humidity : (62.3 to 64.8) %

Air Pressure : 1007.0 mbar

Date of Received : 31 July 2023

Date of Calibration : 31 July 2023

Date of Issue : 02 August 2023

Calibrated by : Akaradath Thippichai

Calibration Method : In-house method CAL-M2001 based on UKAS Publication ref : LAB 14

Edition 5, July 2015

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Weights

<u>ID No.</u>	<u>Cert. No.</u>	<u>Due Date</u>	<u>Traceability</u>
E261-E2624	C02222345	10 Nov 2023	National Institute of Metrology (Thailand), (NIMT)

Approved by :



Laboratory Manager

The Uncertainties are for a confidence probability of approximately 95%

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Certificate of Calibration

Certificate No. : 66-200247-2

Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty \pm (g)
0.001	0.00001	0.000020
0.01	0.00001	0.000021
0.05	0.00001	0.000019
0.1	0.00001	0.000024
1	-0.00001	0.000030
2	0.00000	0.000036
5	-0.00001	0.000046
20	-0.00002	0.000073
50	-0.00004	0.00011
100	-0.00005	0.00020
150	-0.0001	0.00038
200	-0.0001	0.00040

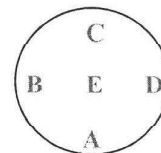
This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor $k = 2.52$, providing a level of confidence of approximately 95%

Eccentric error Load test : 50 g

A	B	C	D	E
0.00002	0.00003	0.00001	0.00004	0.00000

g



Repeatability Load test : 200 g

Stdev. : 0.000048 g

- o0o -





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ENVIR SERVICE CO., LTD.

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201

42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 11 August 2023

Instruments Information

Analyzer Type: SO2 Analyzer Model: 43C	Manufacturer Thermo Environmental S/N: 43C-65967-350
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Calibration System

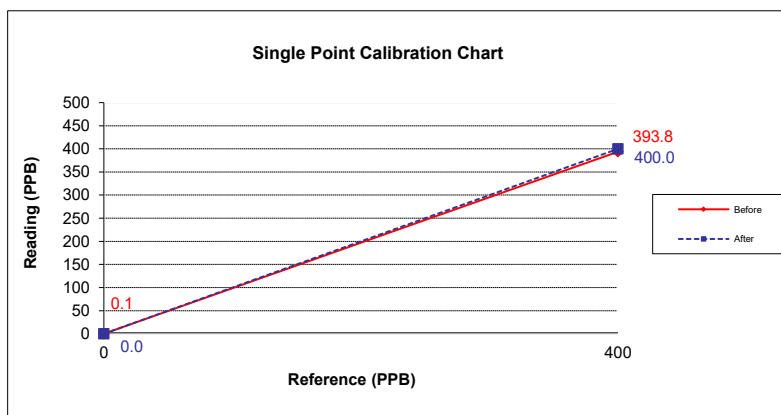
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 46.05 PPM SO2 Conc 46.01 PPM CO Conc 4,487 PPM Expire Date: 19 Sep. 2020

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	393.8	-1.6
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :





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Analyzer Performance Test

Calibrated Date: 11 August 2023

Instruments Information

Analyzer Type: SO2 Analyzer Model: 43C	Manufacturer Thermo Environmental S/N: 0601114-787
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Calibration System

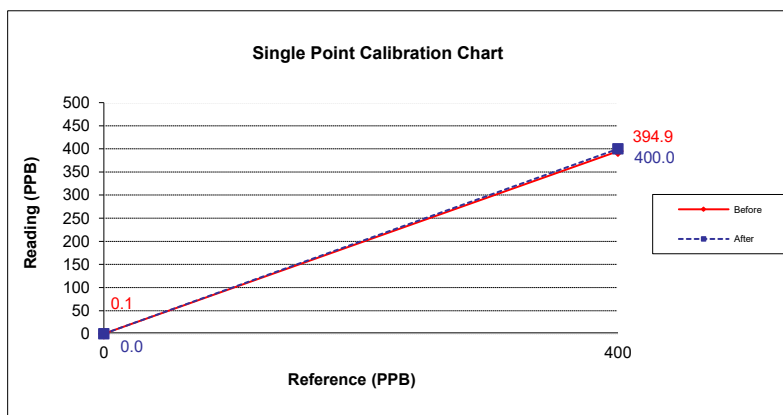
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 46.05 PPM SO2 Conc 46.01 PPM CO Conc 4,487 PPM Expire Date: 19 Sep. 2020

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	394.9	-1.3
After	0.0	0.0	0.0	400.0	400.0	0.0



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42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 11 August 2023

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: 42C	Manufacturer Thermo Environmental S/N: 42C-63476-339
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Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1924	NO Conc 46.05 PPM SO ₂ Conc 46.01 PPM CO Conc 4,487 PPM Expire Date: 19 Sep. 2020

Environment: Temperature 25.5 °C

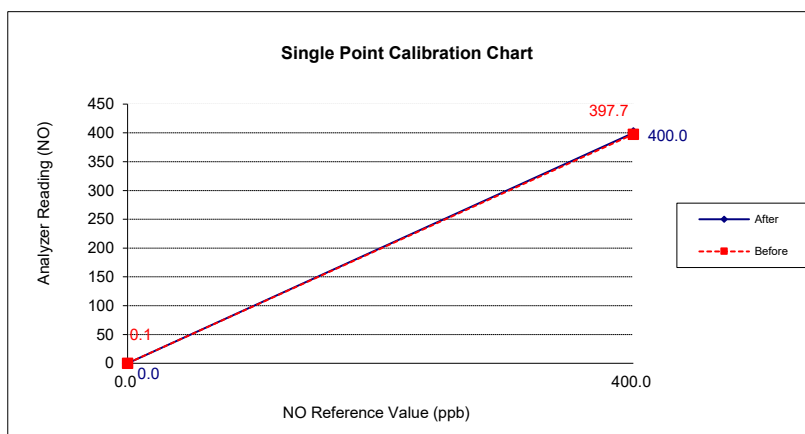
Humidity: 51 %RH

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	397.7	400.0	-0.6
NO _x	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
NO _x	0.0	0.0	0.0	400.0	400.0	0.0



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42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 11 August 2023

Instruments Information

Analyzer Type: NO/NO ₂ /NO _x Analyzer Model: 42C	Manufacturer Thermo Environmental S/N: 42C-69273-362
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Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API Model 701 S/N: 1924	NO Conc 46.05 PPM SO ₂ Conc 46.01 PPM CO Conc 4,487 PPM Expire Date: 19 Sep. 2020

Environment: Temperature 25.5 °C

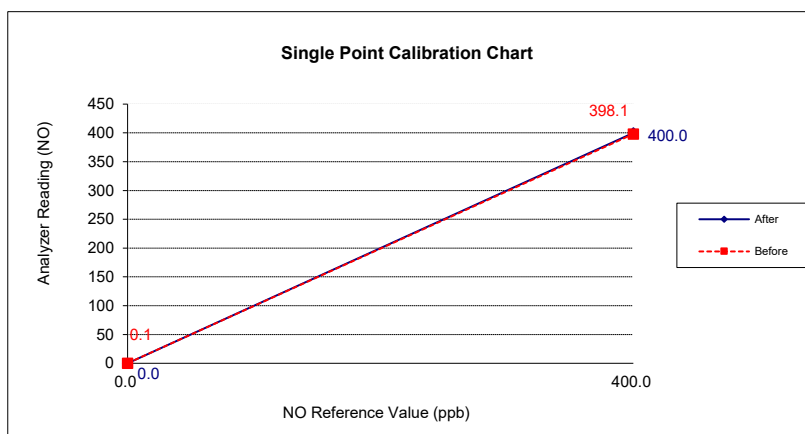
Humidity: 51 %RH

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	398.1	400.0	-0.5
NO _x	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
NO _x	0.0	0.0	0.0	400.0	400.0	0.0



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42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bankok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 11 August 2023

Instruments Information

Analyzer Type: CO Analyzer Model: 48C	Manufacturer Thermo Environmental S/N: 65774-350
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Calibration System

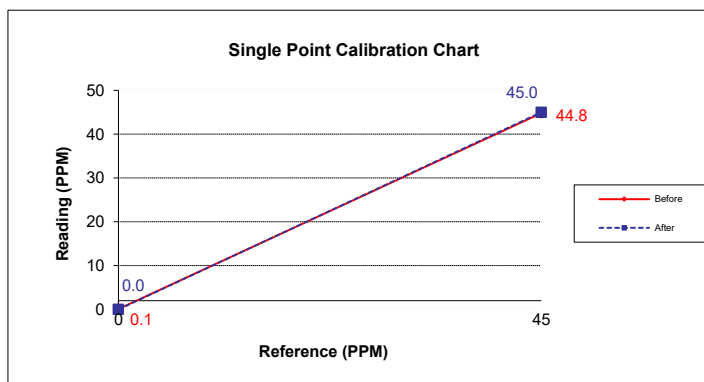
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 46.05 PPM SO2 Conc 46.01 PPM CO Conc 4,487 PPM Expire Date: 19 Sep. 2020

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.8	-0.4
After	0.0	0.0	0.0	45.0	45.0	0.0



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Analyzer Performance Test

Calibrated Date: 11 August 2023

Instruments Information

Analyzer Type: CO Analyzer Model: 48C	Manufacturer Thermo Environmental S/N: 48C-0604815184
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Calibration System

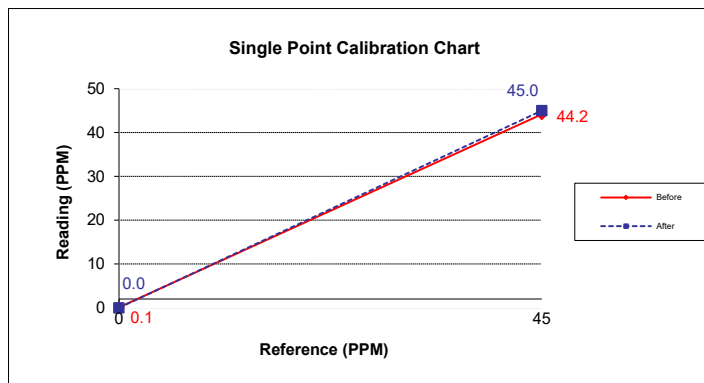
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 46.05 PPM SO2 Conc 46.01 PPM CO Conc 4.487 PPM Cylinder number CC507080 Expire Date: 19 Sep. 2020

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.2	-1.8
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By



Analyzer Performance Test

Calibrated Date: 24 April 2024

Instruments Information

Analyzer Type : Methane-NMHC Analyzer

Manufacturer : Thermo Environmental

Model : 55C

Serial Number : 55C-0515611965

Calibrator Unit

Dilutor Model : Dasibi Model 5008

Serial Number : 705

ZERO AIR Generator : API MODEL 701

Serial Number : 1924

Standard Gas Concentration

Methane (CH₄) 183.0 PPM

Propane 59.1 PPM

Cylinder number 4860

Expire Date: 6 Dec. 2025

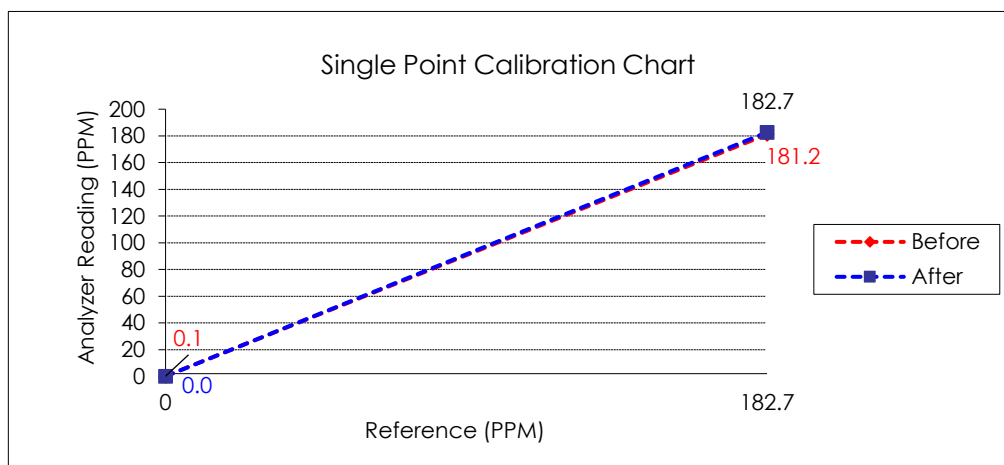
Environment : Temperature 25.5 °C Humidity: 51 %RH

Calibration Report (Before adjust)

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Methane	0.0	0.1	0.1	183.0	181.2	-1.0
NMHC	0.0	0.1	0.1	59.1	58.3	-1.4

Calibration Report (After adjust)

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Methane	0.0	0.0	0.0	183.0	182.7	-0.2
NMHC	0.0	0.0	0.0	59.1	59.0	-0.2



Calibrate By :

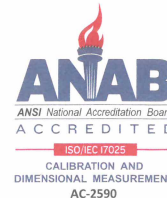
Approve by :

ภาคผนวกที่ 5-2
เอกสารสอบเทียบเครื่องมือตรวจวัดระดับเสียง



Professional Calibration & Services Co., Ltd.

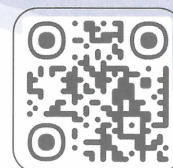
50/888, 50/889 Moo 2, Rungsit-Nakornnayok Rd., Bungeeetho, Thunyaburi,
Pathumthani 12130 Thailand
Tel : (+66)2150-6641 (Autoline), (+66)2569-5158
Email : info@p-cal.com www.p-cal.com



Certificate of Calibration

Certificate Number : EL39305/23
Control Number : PCAL153035
Customer Control : -
Description : Sound Calibrator
Manufacturer : SOUNDTEK
Model : ST-120
Serial Number : 211203764
Customer : Pacific Laboratory Co., Ltd.

Page 1 of 3



14/5358 Moo 14, Tambol Bang Bua Thong, Amphoe Bang Bua Thong,
Nonthaburi 11110

Date of Receipt : 01-Sep-23
Date of Calibration : 01-Sep-23
Environment : Temperature $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$
: Relative Humidity $50\text{ } \% \pm 20\text{ } \%$
Calibration Method : Calibration Procedure Number CP-EL35
Calibration Results : See data attached

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

This certificate is issued in accordance with ISO/IEC17025 and the conditions of accreditation granted by the Accreditation Body which has assessed the measurement capability of the laboratory and its traceability to recognized national standards and to the units of measurement realized at the corresponding national standards laboratory. The results relate only to the item calibrated.

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

Calibrated By

Mr. Varavut Sripanyachon

Authorized Signature



CALIBRATION REPORT

Professional Calibration & Services Co.,Ltd.

Certificate Number : EL39305/23

Page 2 of 3

Equipment Standards Used

Description	Serial No.	Traceability to	Certificate No.	Cal. Due Date
Sound Level Meter	030606101	ANAB : AC-2590	EL09782/23	29-Mar-24
Sound Level Calibrator	141208123	NSC : Calibration 0037	EEL.BP. 16/0366	06-Mar-24

Condition as received : Normal

Definitions :-

- * ANAB - The ANSI National Accreditation Board
- * NSC - National Standardization Council of Thailand

CALIBRATION REPORT

Professional Calibration & Services Co., Ltd.

Certificate No.: EL39305/23

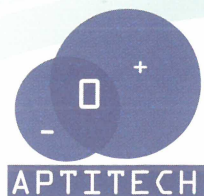
Page : 3 of 3

Calibration Results

Sound Calibration

Nominal	Measured Value	UUC Error	Uncertainty (\pm)
94 dB	93.90 dB	0.10 dB	0.2 dB
114 dB	113.75 dB	0.25 dB	0.2 dB

...End...

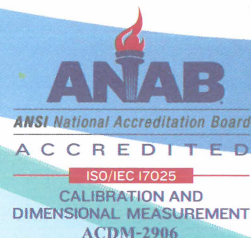


APTITECH CALIBRATION CO., LTD.

50/40 Moo 5 T. Lat Sawai, A. Lamlukka, Pathumthani 12150

Tel. +66 2103-6290 Fax. +66 2103-6291

Email: sales@aptitech-cal.com



CERTIFICATE OF CALIBRATION

Certificate Number : SC230375

Customer : Pacific Laboratory Co.,Ltd.
Address : 14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Thong,
Nonthaburi 11110

Description	: Sound Level Meter	W/O Number	: SC230375
Manufacturer	: Scarlet Tech	Calibration Location	: Laboratory
Model	: ST-11D	Ambient Temperature	: 22 ± 2 °C
Serial Number	: 820968	Ambient Humidity	: 55 ± 15 %RH
ID. Number	: N/A	Received Date	: 25-Aug-2023

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor $k=2$ such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

Standard Equipments

Description	Serial No.	Certificate No.	Traceability	Due Date
Sound Level Calibrator	141011576	CP20230261EA	TISI: 22-LB0119	05-Jul-24

APTITECH

Authority of Calibration

Approved Signatory



Calibration Date : 25-Aug-2023

Issued Date : 28-Aug-2023

Calibrated By : Mr. Rattapong Janpanya

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.

CALIBRATION REPORT

Certificate Number : SC230375

Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

Calibration Results

Appearance and function of use : Good
Results of Calibration : Without any adjustment
Sound Level Calibration
- Frequency Weighting : A
- Resolution : 0.1 dB

Sound Level Measurement (Slow Mode)

Parameter	UUC Range	Standard Value	UUC Reading	UUC Error	(±) Uncertainty
LFp	20-140 dB	93.86 dB	93.8 dB	-0.06 dB	0.60 dB
		113.87 dB	113.7 dB	-0.17 dB	0.60 dB
LSp	20-140 dB	93.86 dB	93.8 dB	-0.06 dB	0.60 dB
		113.87 dB	113.7 dB	-0.17 dB	0.60 dB
LIp	20-140 dB	93.86 dB	93.7 dB	-0.16 dB	0.60 dB
		113.87 dB	113.7 dB	-0.17 dB	0.60 dB

Sound Level Measurement (Fast Mode)

Parameter	UUC Range	Standard Value	UUC Reading	UUC Error	(±) Uncertainty
LFp	20-140 dB	93.86 dB	93.8 dB	-0.06 dB	0.60 dB
		113.87 dB	113.8 dB	-0.07 dB	0.60 dB
LSp	20-140 dB	93.86 dB	93.8 dB	-0.06 dB	0.60 dB
		113.87 dB	113.7 dB	-0.17 dB	0.60 dB
LIp	20-140 dB	93.86 dB	93.8 dB	-0.06 dB	0.60 dB
		113.87 dB	113.7 dB	-0.17 dB	0.60 dB

--- End of Certificate ---

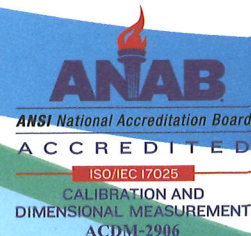


APTITECH CALIBRATION CO., LTD.

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Email. sales@aptitech-cal.com



CERTIFICATE OF CALIBRATION

Certificate Number : SC240093

Customer : Pacific Laboratory Co.,Ltd.
Address : 14/5358 Moo 14 Tambol Bang Bua Thong, Amphoe Bang Thong,
Nonthaburi 11110

Description	: Sound Level Meter	W/O Number	: SC240093
Manufacturer	: Scarlet Tech	Calibration Location	: Laboratory
Model	: ST-11D	Ambient Temperature	: 22 ± 2 °C
Serial Number	: 820967	Ambient Humidity	: 55 ± 15 %RH
ID. Number	: N/A	Received Date	: 23-Mar-2024

This certifies that the above instrument was calibrated in compliance with the Calibration Systems Requirement of ISO/IEC 17025:2017 in accordance with referenced procedures. Standards used to perform this calibration are certified by or traceable to National Institute of Metrology (Thailand) and/or other recognized national measurement institutes which realizes the units of measurement according to the International System of Units (SI Unit).

Measurement uncertainties at the time of test are given where applicable. They are calculated in accordance with the method described in The Expression of Uncertainty and Confidence in Measurement (M3003).

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor $k=2$ such that the coverage probability corresponds to approximately 95%. This result of calibration was found accurate as shown on date and place of calibration only.

Standard Equipments

Description	Serial No.	Certificate No.	Traceability	Due Date
Sound Level Calibrator	141011576	CP20230261EA	TISI: 22-LB0119	05-Jul-24

APTITECH

Authority of Calibration

Approved Signatory



Calibration Date : 23-Mar-2024

Issued Date : 26-Mar-2024

Calibrated By : Ms. Hathaichanok Kaewsrissai

Calibration certificates without signatures are not valid. This certificate applied to only the item identified and shall not be reproduced other than in full, without the specific written approval by APTITECH CALIBRATION CO., LTD.

CALIBRATION REPORT

Certificate Number : SC240093

Calibration Method

The Unit Under Calibration (UUC) was calibrated by comparison measurement with sound level calibrator. The calibration has been accomplished in an ambient environment controlled, base on the in-house calibration procedure. The identification of the laboratory's calibration procedure employed are CP-7.2-01-107

Calibration Results

Appearance and function of use : Good
Results of Calibration : Without any adjustment
Sound Level Calibration
- Frequency Weighting : A
- Resolution : 0.1 dB

Sound Level Measurement (Slow Mode)

Parameter	UUC Range	Standard Value	UUC Reading	UUC Error	(±) Uncertainty
LFp	20-140 dB	93.86 dB	93.7 dB	-0.16 dB	0.61 dB
		113.87 dB	113.7 dB	-0.17 dB	0.61 dB
LSp	20-140 dB	93.86 dB	93.7 dB	-0.16 dB	0.61 dB
		113.87 dB	113.7 dB	-0.17 dB	0.61 dB
Llp	20-140 dB	93.86 dB	93.7 dB	-0.16 dB	0.61 dB
		113.87 dB	113.7 dB	-0.17 dB	0.61 dB

Sound Level Measurement (Fast Mode)

Parameter	UUC Range	Standard Value	UUC Reading	UUC Error	(±) Uncertainty
LFp	20-140 dB	93.86 dB	93.7 dB	-0.16 dB	0.61 dB
		113.87 dB	113.8 dB	-0.07 dB	0.61 dB
LSp	20-140 dB	93.86 dB	93.7 dB	-0.16 dB	0.61 dB
		113.87 dB	113.8 dB	-0.07 dB	0.61 dB
Llp	20-140 dB	93.86 dB	93.7 dB	-0.16 dB	0.61 dB
		113.87 dB	113.8 dB	-0.07 dB	0.61 dB

--- End of Certificate ---

ภาคผนวกที่ 5-3
เอกสารสอบเทียบเครื่องมือตรวจวัดความสั่นสะเทือน



CLC
Accredited
ISO/IEC 17025

CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CERTIFICATE OF CALIBRATION FOR

NOMENCLATURE	:	VIBRATION METER
MANUFACTURER	:	INSTANTEL
MODEL / TYPE	:	721A2501/721A2901
SERIAL NO.	:	UM13203/UM13203
CLID. NO.	:	252000160
JOB CONTROL NO.	:	240125008595
CALIBRATION SERVICE	:	<input checked="" type="checkbox"/> IN-LABORATORY <input type="checkbox"/> ON-SITE

CUSTOMER : PACIFIC LABORATORY CO., LTD.
14/5358 MOO 14 TAMBOL BANG BUA THONG
AMPHOE BANG BUA THONG NONTABURI 11110

DATE OF RECEIVED : 25 January 2024

DATE OF ISSUED : 30 January 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer

Approved By :

This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the
International System of Units (SI)

Certificate No. Q24008595

F3-011-05/12-23

page 1 of 2



@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE	:	VIBRATION METER
MANUFACTURER	:	INSTANTEL
MODEL / TYPE	:	721A2501/721A2901
SERIAL NO.	:	UM13203/UM13203
DATE OF CALIBRATION	:	26 January 2024

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$

Relative Humidity : $(55 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPEE-08** based on **ISO 16063-21** as calibration guideline.
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter,
Accelerometer and Measuring Amplifier which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Digital Multimeter, Hewlett Packard Model 34401A S/N. US36044686.
2. Programmable Timer/Counter, Philips Model PM6680B S/N. SM607101.
3. Accelerometer with Measuring Amplifier, Bruel & Kjaer Model 8305, 2525 S/N. 397018, 2434988.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand)
Certificate No. EE-0100-23, Due Date 01 December 2024.
2. The measurements are traceable to International System of Units (SI), through Aeronautical Radio of Thailand Ltd.
Certificate No. 07-0043/23 , Due Date 12 April 2024.
3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand)
Certificate No. AV-0052-23, Due Date 26 September 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied
by the coverage factor $k = 2,00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %.
It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. **Q24008595**

F3-011-05/12-23





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ISO/IEC 17025

CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230

Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	± (% of rdg.)
10.0	160 Hz	peak	10.000	10.234	-0.234	1.1
20.0	160 Hz		20.000	20.341	-0.341	0.9
30.0	160 Hz		30.000	30.446	-0.446	0.9
40.0	160 Hz		40.000	40.576	-0.576	0.9
50.0	160 Hz		50.000	50.613	-0.613	0.9

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 2 of 67

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q24008595

F3-011-05/12-23

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CALIBRATION LABORATORY Co., LTD.

2/10-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE	:	VIBRATION METER
MANUFACTURER	:	INSTANTEL
MODEL / TYPE	:	721A2501/721A2901
SERIAL NO.	:	UM13202/UM13202
CLID. NO.	:	252102517
JOB CONTROL NO.	:	240125008596
CALIBRATION SERVICE	:	<input checked="" type="checkbox"/> IN-LABORATORY <input type="checkbox"/> ON-SITE

CUSTOMER : PACIFIC LABORATORY CO., LTD.
14/5358 MOO 14 TAMBOL BANG BUA THONG
AMPHOE BANG BUA THONG NONTABURI 11110

DATE OF RECEIVED : 25 January 2024

DATE OF ISSUED : 30 January 2024

The report of calibration shall not be reproduced except in full without approval of the Calibration Laboratory Co., Ltd.

Calibrated By :

Suwit Phuanbusabong
Calibration Engineer



Approved By :



This Calibration Certificate documents the traceability to national standards, which realize the units of measurement according to the
International System of Units (SI)

Certificate No. Q24008596

F3-011-05/12-23

page 1 of 2



@clccalibration

REPORT OF CALIBRATION FOR

NOMENCLATURE	:	VIBRATION METER
MANUFACTURER	:	INSTANTEL
MODEL / TYPE	:	721A2501/721A2901
SERIAL NO.	:	UM13202/UM13202
DATE OF CALIBRATION	:	26 January 2024

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2)^{\circ}\text{C}$

Relative Humidity : $(55 \pm 15) \% \text{RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. **CLC-CPEE-08** based on **ISO 16063-21** as calibration guideline.
The calibration was performed by using Digital Multimeter, Programmable Timer/Counter,
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3. The measurements are traceable to International System of Units (SI), through National Institute of Metrology (Thailand) Certificate No. AV-0052-23, Due Date 26 September 2024.

UNCERTAINTY :

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It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24008596

F3-011-05/12-23

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CALIBRATION LABORATORY Co., LTD.

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Tel. 02-578-0353-4 Fax: 02-578-2672 www.cal-laboratory.com E-mail:sale@cal-laboratory.com



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

CALIBRATION DATA

VELOCITY RESULT

Test point		Mode	STD Reading	DUC Reading	Correction	Uncertainty
(mm/s)	(frequency)		(mm/s)	(mm/s)	(mm/s)	± (% of rdg.)
10.0	160 Hz	peak	10.000	10.304	-0.304	1.1
20.0	160 Hz		20.000	20.396	-0.396	0.9
30.0	160 Hz		30.000	30.479	-0.479	0.9
40.0	160 Hz		40.000	40.587	-0.587	0.9
50.0	160 Hz		50.000	50.649	-0.649	0.9

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 2 of 67

This report is valid for the above stated instrument/s only.

End of Certificate

Certificate No. Q24008596

F3-011-05/12-23

page 3 of 3



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