

ภาคผนวก จ

เอกสารสอบเทียบเครื่องมือ



List of Instruments Certification for Water Quality Analysis

1.โครงการรถไฟฟ้าสีเขียวอ่อนช่วงแบร์ริง-สมุทรปราการ

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Water									
1	pH Meter	pH	YSI	pH100A JC03354	Technology Promotion Association (Thailand-Japan)	23CH1487	22 Nov 23	21 Nov 24	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
1	Orifice Transfer Standard Calibrator	Particulate Matter < 10 µm (PM ₁₀)	Andersen Instruments, Inc.	G25A 11MX	Jiranatee Associates Co., Ltd.	CO-005-66	12 Jun 23	11 Jun 24	-
2	U-Tube Manometer	Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	23P1402	9 May 23	8 May 24	-
3	Aneroid Barometer	Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	23P1855	2 Jun 23	1 Jun 24	-
4	Dial Thermo-Hygrometer	Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	23H1200	6 Jun 23	5 Jun 24	-
5	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1182920005	UAE Consultant Co.,Ltd.	13112023	13 Nov 23	12 Nov 24	-
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1182920006	UAE Consultant Co.,Ltd.	01112023	1 Nov 23	31 Oct 24	-
7	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1182920009	UAE Consultant Co.,Ltd.	13112023	13 Nov 23	12 Nov 24	-
8	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1191503036	UAE Consultant Co.,Ltd.	13112023	13 Nov 23	12 Nov 24	-
9	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i 1191503037	UAE Consultant Co.,Ltd.	13112023	13 Nov 23	12 Nov 24	-
10	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0143262 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01D3	21 Jun 21	21 Jun 24	-
11	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48C 48C-62460-355/5	UAE Consultant Co.,Ltd.	08122023	8 Dec 23	7 Dec 24	-
12	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48C 48C-62494-335-5	UAE Consultant Co.,Ltd.	08112023	8 Nov 23	7 Nov 24	-
13	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48C 48C-69160-362	UAE Consultant Co.,Ltd.	08112023	8 Nov 23	7 Nov 24	-

List of Instruments Certification for Air & Noise Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration	Remark
Ambient									
14	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48C 48C-73881-375	UAE Consultant Co.,Ltd.	08112023	8 Nov 23	7 Nov 24	-
15	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48C 48C-71185-368	UAE Consultant Co.,Ltd.	18122023	18 Dec 23	17 Dec 24	-
16	Standard Gases (Mixture)	Carbon Monoxide	Airgas	EB0143262 2015PSIG	Airgas an Air Liquide company	E04NI99E15A01D3	21 Jun 21	21 Jun 24	-
17	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	WL-21 2111DR0052	Thai Meteorological Department	098/24	22 Feb 24	21 Feb 25	-
18	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	WL-21 2111DT0058	Thai Meteorological Department	121/24	13 Mar 24	12 Mar 25	-
19	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	WL-21 2112DR0065	Thai Meteorological Department	097/24	22 Feb 24	21 Feb 25	-
20	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	WL-21 2311DR0037	Thai Meteorological Department	123/24	13 Mar 24	12 Mar 25	-
21	Wind Speed/Wind Direction	WS/WD	Scarlet Tech Ltd.	WL-21 2205DT0008	Thai Meteorological Department	122/24	13 Mar 24	12 Mar 25	-
22	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	Larson Davis	CAL150 6171	Innovative Instrument Co.,Ltd.	23-ACT-118	4 Aug 23	3 Aug 24	-
23	Sound Level Meter	$L_{Aeq} 1 \text{ hour}$, $L_{Aeq} 24 \text{ hours}$, L_{Amax} L_{A90} , L_{Adn}	Larson Davis	LxT2 0005293	Innovative Instrument Co.,Ltd.	23-SLM-210	23 Jun 23	22 Jun 24	-
24	Sound Level Meter	$L_{Aeq} 1 \text{ hour}$, $L_{Aeq} 24 \text{ hours}$, L_{Amax} L_{A90} , L_{Adn}	Larson Davis	LxT2 0005294	Innovative Instrument Co.,Ltd.	23-SLM-222	28 Jun 23	27 Jun 24	-
25	Sound Level Meter	$L_{Aeq} 1 \text{ hour}$, $L_{Aeq} 24 \text{ hours}$, L_{Amax} L_{A90} , L_{Adn}	Larson Davis	LxT2 0005296	Innovative Instrument Co.,Ltd.	23-SLM-209	23 Jun 23	22 Jun 24	-
26	Sound Level Meter	$L_{Aeq} 1 \text{ hour}$, $L_{Aeq} 24 \text{ hours}$, L_{Amax} L_{A90} , L_{Adn}	Larson Davis	LxT2 0005305	Innovative Instrument Co.,Ltd.	23-SLM-225	28 Jun 23	27 Jun 24	-
27	Sound Level Meter	$L_{Aeq} 1 \text{ hour}$, $L_{Aeq} 24 \text{ hours}$, L_{Amax} L_{A90} , L_{Adn}	Larson Davis	LxT2 0005339	Innovative Instrument Co.,Ltd.	23-SLM-223	28 Jun 23	27 Jun 24	-



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
154-2 PATTANAKARN ROAD SOI 18, SATHULANG, SI-ANGUANG BANGKOK 10140
TEL. 0-2717-9001-29 FAX. 0-2716-9484



Cert.No.: 23CH1487
Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : EcoSense
Model : pH10DA
Serial No. : JC03354
ID No. : UAE.EFM.063/2562(ENV.pH 03/62)
Condition As-Received: Used Item
Received Date : 21 November 2023
Calibration Date : 22 November 2023
Reference : 2311-0720WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In-house method
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by : Warakorn Lemgagtrakul

Approved by :
Approved Signatory

(✓) Saitip Meangmai
() Warakorn Lemgagtrakul
() Ponpan Paipim

Issue Date : 27 November 2023

The Uncertainties are for a confidence probability of approximately 95 %

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Approval of the head of Corporate Services & Equipment Calibration and Testing services

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A 0061266



Cert.No.: 23CH1487
Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -
Instrument Serial No. ID No. Cert. No. Due Date
1) Document Process Calibrator 54030049 130RC116 23E2802 27 Aug 2024
2) Ref. Standard Thermometer 4962054 110RC044 23I908 26 July 2024
This certification is traceable to the International System of Unit maintained through:-
- Technology Promotion Association (Thailand-Japan)

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	913598	14 July 2025
pH 6.985	CPA chem	913599	14 July 2024
pH 9.997	CPA chem	940106	02 Nov 2024

- 3 This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (± mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: JC03354	4.00	177.48	177	4.01	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	7.00	0.00	0	7.00	0.58	2.00
	10.00	-177.48	-178	10.01	0.58	2.00

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Cert.No.: 23CH1487
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7)(7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (±)	Coverage factor k
pH Electrode S/N.: 230906SIA605377	4.008	4.01	174	0.0085	2.05
	6.985	7.00	-2	0.0098	2.00
	6.985	7.00	-2	0.0093	2.00
	9.997	10.00	-177	0.0092	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model :
- Serial No. : 230906SIA605377
Dimension of probe:
- Length : 110 mm
- Diameter : 12 mm
- Immersion Depth : 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (± °C)	Coverage factor k
25.0	25.002	25.1	0.098	0.13	2.00
30.0	30.001	30.1	0.099	0.13	2.00
35.0	35.003	35.0	-0.003	0.13	2.00

Remark : - UUC* = Unit Under Calibration

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

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a 1191351



Niranatee Associates Co.,Ltd
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E-mail: niranate@niranatee.com
Web site: www.niranatee.com

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

Flow measurement laboratory
Calibration services department.



NSC-TISI-TIS 17025
CALIBRATION 0367

CERTIFICATE OF CALIBRATION

Certificate No. : CO-005-66

Page 1 of 2 Pages

MEASUREMENT ITEM

MANUFACTURER :
MODEL/TYPE :
SERIAL NUMBER :
ID NUMBER :
CONDITION AS-RECEIVED :
CUSTOMER :

Top Load Office

Anderson Instruments

G25A

111MX

UAE.ANV.008/2543

Used Item

United Analyst and Engineering Consultant Co.,Ltd.

81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong,

Bangkok 10260

RECEIVED DATE

10 Jun 2023

MEASUREMENT DATE

12 Jun 2023

ISSUE DATE

12 Jun 2023

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 ± 30 hPa

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions.

Measurement Condition : The average values during measurement are 24.0 °C and 56.4%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 Office gas flow device was calibrated against
Standard Rotary Displacement Meter (Roots,
Meter) Model G65/MC/V2-6p. The Wt-CI-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 VSL (National
Metrology Institute of Netherlands) via Certificate
number: G3211931

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. Soravit Thachalad
Ms. Jitraporn Lertsomphol

Approved signatory:

Mr. Parinya Booncharoen
Calibration Department Manager

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	Ap_meter mmHg	Ap_orifice inH ₂ O	Y	Standard Flow [Qs] m ³ /min
1	0.705	754.535	24.09	23.49	51.470	1.745	1.318	0.656
2	0.998	754.592	24.01	23.68	55.777	3.453	1.855	0.922
3	1.124	754.473	23.93	23.53	57.502	4.619	2.145	1.066
4	1.172	754.436	23.39	23.00	57.960	5.187	2.275	1.128
5	1.418	754.502	23.52	23.02	58.014	7.616	2.756	1.365

Slope (m): 2.02897
Intercept (b): -0.01391
Correlation coefficient (r): 0.99988
Uncertainty (k=2): 0.015 m³/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	Ap_meter mmHg	Ap_orifice inH ₂ O	Y	Standard Flow [Qa] m ³ /min
1	0.705	754.535	24.09	23.49	51.470	1.745	0.829	0.658
2	0.998	754.592	24.01	23.68	55.777	3.453	1.166	0.925
3	1.124	754.473	23.93	23.53	57.502	4.619	1.349	1.070
4	1.172	754.436	23.39	23.00	57.960	5.187	1.428	1.130
5	1.418	754.502	23.52	23.02	58.014	7.616	1.790	1.368

Slope (m): 1.27084
Intercept (b): -0.00675
Correlation coefficient (r): 0.99946
Uncertainty (k=2): 0.015 m³/min

End of Certificate of Calibration



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Certificate of Calibration

Certificate No.: 23P1402
Page: 1 of 2

Equipment: U Tube Manometer

Manufacturer: Dwyer

Model: 1221-36-WM

Serial No.: -

ID No.: UAE.EFM.180/2561

Condition As-Received: Used Item

Received Date: 26 April 2023

Calibration Date: 09 May 2023

Reference: 2304-0703WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1010 mbar

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Submitted by: United Analyst and Engineering Consultant Co.,Ltd.

81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P04, using "DKD-R 6-1 : Calibration of Pressure Gauges, Edition 03/2014 " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC100P	1169	MP-0137-22	24 Aug 2023

2.This result of calibration was made on requested at the point specified by customer.

3.Scale and conversion factor is 1 kPa = 4.0146293 inH₂O

4.This instrument was used clean air as pressure media.

5.This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6.This instrument was installed in vertical orientation and top of the pressure port was used as the reference level.

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

8.This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Suwit Aussamee

Issue Date: 11 May 2023

Approved Signatory: Attapol P.

[] Phalinee Prabpaipal

[] Sura Suwannasri

✓ Attapol Panurach

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Cert.No.: 23P1402
Page: 2 of 2

Result of calibration:- Without adjustment

Function:- Pressure Measurement

Increasing Pressure

Range: 0 inH₂O to 36 inH₂O

Scale Interval: 0.1 inH₂O (The Fifth Estimate)

Applied Pressure (inH ₂ O)	High-port side (inH ₂ O)	Low-port side (inH ₂ O)	ΔP (inH ₂ O)	Error (inH ₂ O)
0.00	0.00	0.00	0.00	0.00
2.00	1.00	-1.00	2.00	0.00
4.00	2.00	-2.00	4.00	0.00
6.00	3.00	-3.00	6.00	0.00
8.00	4.00	-4.00	8.00	0.00
10.00	5.00	-5.00	10.00	0.00
12.00	6.00	-6.00	12.00	0.00
14.00	7.00	-7.00	14.00	0.02
16.00	8.00	-8.00	16.00	0.02
18.00	9.00	-9.00	18.00	0.06
20.00	10.00	-10.00	20.00	0.06
22.00	11.00	-11.00	22.00	0.04
24.00	12.00	-12.00	24.00	0.08
26.00	13.00	-13.00	26.00	0.08
28.00	14.00	-14.00	28.00	0.06
30.00	15.00	-15.00	30.00	0.04
32.00	16.00	-16.00	32.00	0.02
34.00	17.00	-17.00	34.00	0.00
35.80	17.96	-17.98	35.94	0.14

The uncertainty of measurement was ± 0.11 inH₂O

* UUC = Unit Under Calibration

* ΔP = High-port side - Low-port side

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 %.

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Attapol P.

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Certificate of Calibration

Certificate No.: 23P1855
Page: 1 of 2

Equipment: Aneroid Barometer

Manufacturer: Barigo

Model: -

Serial No.: -

ID No.: UAE.ANV.122/2550

Condition As-Received: Used Item

Received Date: 26 May 2023

Calibration Date: 02 June 2023

Reference: 2305-0919WSC

Ambient Temperature: (23 ± 2) °C

Relative Humidity: (50 ± 15) %

Atmospheric Pressure: 1007 mbar

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Submitted by: United Analyst and Engineering Consultant Co.,Ltd.

81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to in-house calibration procedure CP-P10, using "DKD-R 6-1 : Calibration of Pressure Gauges, Edition 03/2014 " as a guidelines.

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Barometer	DPI142	1422505046	MP-0094-23	03 May 2024

2.This instrument was installed in vertical orientation and center of the dial was used as the reference level.

3.This result of calibration was made on requested at the point specified by customer.

4.This result of calibration instrument was in absolute pressure.

5.This instrument was used clean air as pressure media.

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

7.This Certification is traceable to the International System of Unit maintained through:-

-National Institute of Metrology Thailand (NIMT)

Calibrated by: Suksan Khankaew

Issue Date: 06 June 2023

Approved Signatory: Attapol P.

[] Phalinee Prabpaipal

[] Sura Suwannasri

✓ Attapol Panurach

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Cert.No.: 23P1855
Page: 2 of 2

Result of calibration:- Without adjustment
Function:- Absolute Pressure Measurement

Range: 960 hPa to 1030 hPa
Scale Interval: 1 hPa (The Fifth Estimate)

Increasing Pressure

Applied Pressure (hPa)	958.50	969.59	980.35	990.39	1001.01	1011.15	1020.94	1031.45
UUC* Indication (hPa)	960.0	970.0	980.0	990.0	1000.0	1010.0	1020.0	1030.0
Error (hPa)	1.50	0.41	-0.35	-0.39	-1.01	-1.15	-0.94	-1.45

Decreasing Pressure

Applied Pressure (hPa)	1031.45	1021.61	1012.16	1002.38	992.17	982.20	970.69	959.32
UUC* Indication (hPa)	1030.0	1020.0	1010.0	1000.0	990.0	980.0	970.0	960.0
Error (hPa)	-1.45	-1.61	-2.16	-2.38	-2.17	-2.20	-0.69	0.58

The uncertainty of measurement was ± 0.30 hPa

* UUC = Unit Under Calibration

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 %.

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Attapol P.

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a 1165504



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 9-2717-3009-24 FAX. 9-2719-9484



Certificate of Calibration

Certificate No.: 23H1200
Page: 1 of 2

Equipment: Dial Thermo-Hygrometer

Manufacturer: Berigo

Model: -

Serial No.: -

ID No.: UAE.ANV.130/2550

Condition As-Received: Used Item

Received Date: 26 May 2023

Calibration Date: 30 May 2023
to 06 June 2023

Reference: 2305-0819WSC

Ambient Temperature: (25 \pm 3) °C

Relative Humidity: (50 \pm 20) %

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except with the prior written approval of the head of
Corporate Services 3: Equipment Calibration and Testing Services.

Submitted by: United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Procedure used: Calibration were conducted using in-house calibration procedure CP-H02 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

Condition of this result of calibration

1. Reference standards instruments:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Hygro-M2 Dew Point Monitor	5112	2360195	20703	02 Aug 2023
2) Handheld Thermometer With Sensor	1523	3240076	23105	15 Mar 2024

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

3. This Certification is traceable to the International System of Unit maintained through:-

- National Institute of Standards and Technology (NIST), The United States of America
- Technology Promotion Association (Thailand-Japan), NSQ-ONSC Accredited No. Calibration 0008

Calibrated by: Somchai Durmwor
Issue Date: 07 June 2023

Approved Signatory:

J Chakrit Waewwanjua
J Ponthippa Tameyakul
J Viporn Tantiyawutti

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Cert. No.: 23H1200
Page: 2 of 2

Result of Calibration:- Before Adjustment
Function: Humidity Measurement

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (\pm %R.H.)
25.0	40.1	48	7.9	1.6
25.0	60.0	63	3.0	1.7
25.0	80.0	76	-4.0	1.9

Result of Calibration:- After Adjustment
Function: Humidity Measurement

Reference Temperature (°C)	Standard Humidity (%R.H.)	UUC* Reading (%R.H.)	Error (%R.H.)	Uncertainty of Measurement (\pm %R.H.)
25.0	40.1	44	3.9	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	75	-5.0	1.9

Result of Calibration:- Without Adjustment
Function: Temperature Measurement

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (\pm °C)
19.987	20.0	0.013	0.72
30.016	30.0	-0.016	0.72
39.944	39.5	-0.444	0.72

UUC* : Unit Under Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor $k = 2.00$, providing confidence level approximately 95%.

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Attapol P.

เอกสารไม่ควบคุม
a 1165295



United Analyst and Engineering Consultant Co., Ltd.

3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260

Tel. 0 2763 2828 Fax 0 2763 2800 www.uaiconsultant.com E-mail: uae@uaiconsultant.com

MULTI-POINT GAS TEST REPORT

Test Date: Nov 13, 2023

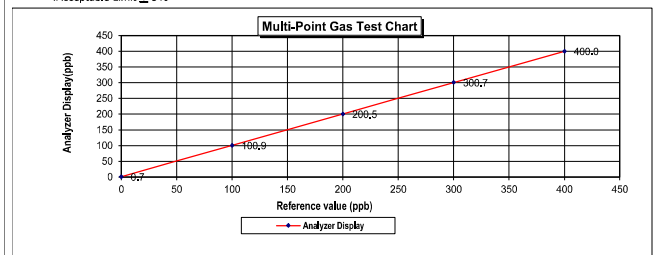
Equipment: Gas Analyzer (NO₂)
Manufacturer: Thermo Scientific
Model: 42i
Serial Number: 1182920005

Standard Gas Concentration

Standard Gas Concentration	Value	Unit	Dilutor Detail
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer: Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model: 146i
Methane (CH ₄)	-	PPM	Serial Number: 1180540071
Carbon Monoxide (CO)	984.8	PPM	
Cylinder No.:	EB0143262		
Expiration Date:	Jun 21, 2024		

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.70	0.70	0.70
Level 2 20.00%	100.0	0.90	0.89	0.89
Level 3 40.00%	200.0	0.50	0.25	0.25
Level 4 60.00%	300.0	0.70	0.23	0.23
Level 5 80.00%	400.0	0.00	0.00	0.00
Remark: Measuring Range	500.0 ppb	Average Difference (%)	0.41	
:Acceptable Limit $\pm 5\%$				



Calculate by

13 Nov. 2023

Approve by

13 Nov. 2023

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MULTI-POINT GAS TEST REPORT

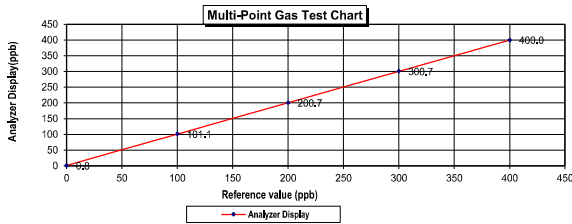
Test Date : Nov 1, 2023

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1182920006

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.8	0.80	0.80
Level 2	20.00%	100.0	1.10	1.09	1.09
Level 3	40.00%	200.0	0.70	0.35	0.35
Level 4	60.00%	300.0	0.70	0.23	0.23
Level 5	80.00%	400.0	0.00	0.00	0.00
Remark : Measuring Range		500.0 ppb	Average Difference (%)		0.49



Calculate by

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MULTI-POINT GAS TEST REPORT

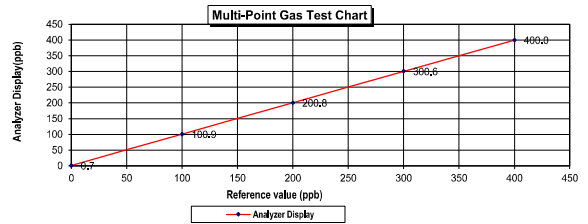
Test Date : Nov 13, 2023

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1182920009

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.70	0.70	0.70
Level 2	20.00%	100.0	100.9	0.90	0.89	0.89
Level 3	40.00%	200.0	200.8	0.80	0.40	0.40
Level 4	60.00%	300.0	300.6	0.60	0.20	0.20
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.44



Calculate by

13 Nov 2023

Approve by

13 Nov 2023

MULTI-POINT GAS TEST REPORT

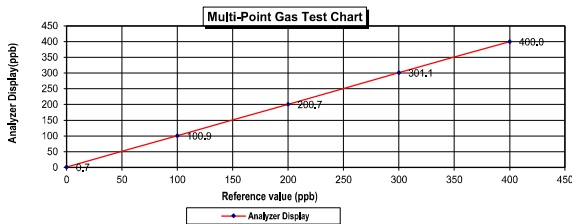
Test Date : Nov 13, 2023

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1191503036

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.70	0.70	0.70
Level 2	20.00%	100.0	100.9	0.90	0.89	0.89
Level 3	40.00%	200.0	200.7	0.70	0.35	0.35
Level 4	60.00%	300.0	301.1	1.10	0.37	0.37
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.46



Calculate by

13 Nov 2023

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13 Nov 2023

MULTI-POINT GAS TEST REPORT

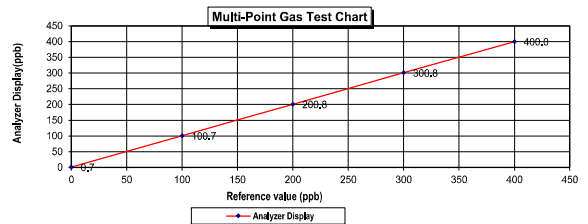
Test Date : Nov 13, 2023

Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : 1191503037

Standard Gas Concentration			Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	984.8			
Cylinder No. :	EB0143262			
Expiration Date :	Jun 21, 2024			

Multi-point gas test data

Reference Value (ppb)			Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.70	0.70	0.70
Level 2	20.00%	100.0	100.7	0.70	0.70	0.70
Level 3	40.00%	200.0	200.8	0.80	0.40	0.40
Level 4	60.00%	300.0	300.8	0.80	0.27	0.27
Level 5	80.00%	400.0	400.0	0.00	0.00	0.00
Remark : Measuring Range			500.0 ppb	Average Difference (%)		0.41



Calculate by

13 Nov 2023

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13 Nov 2023

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number: ED4N100E5A0103 Reference Number: 122-402135167-1
Cylinder Number: EB0143262 Cylinder Volume: 144.4 CF
Laboratory: 124 - Durham (SAF) - NC Cylinder Pressure: 2015 PSIG
PGVP Number: B2202* Valve Outlet: 560
Gas Code: CO,NO,NOX,SC2,BALN Certification Date: Jun 21, 2021

Expiration Date: Jun 21, 2024

Certification performed in accordance with EPA Testability Protocol for Analytical Certification of Stationary Sources (May 2012) approved EPA
GDP-1654, using the assay procedures under analytical verification does not require cylinder for analytical verification. The cylinder has a special inspection
underlying to ensure leakage at a confidence level of 95%. There are no significant impurities noted about the use of this calibration service. All concentrations are in
ppm unless otherwise noted.
Do Not Use This Label Below 100ppm, i.e. 0.7 megapascal

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	45.94 PPM	G1	+/- 1.4% NIST Traceable	08/14/2021, 06/21/2021
NITRIC OXIDE	45.00 PPM	45.94 PPM	G1	+/- 1.4% NIST Traceable	08/14/2021, 06/21/2021
SULFUR DIOXIDE	45.00 PPM	44.50 PPM	G1	+/- 1.5% NIST Traceable	08/14/2021, 06/21/2021
CARBON MONOXIDE	1000 PPM	984.8 PPM	G1	+/- 0.7% NIST Traceable	08/14/2021
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	2051110	CC7M308	49.32 PPM NITRIC OXIDE/NITROGEN	+/- 1.3%	Feb 02, 2025
PRM	7386	CE68565	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.3%	Feb 20, 2020
GMS	4014282182	CC68581	4.343 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.1%	Feb 20, 2020
NTRM	16011043	CC473277	45.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Jun 17, 2022
NTRM	14038118	CC454277	350.9 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Nov 16, 2025

Instrument/Make/Model	Analytical Principle	Last Multi-point Calibration
Model: 9700 AHR800-533 CO	FTIR	Jun 03, 2021
Model: 9700 AHR800-533 NO	FTIR	Jun 03, 2021
Model: 9700 AHR800-533 NO2	FTIR	Jun 03, 2021
Model: 9700 AHR800-533 SO2	FTIR	Jun 03, 2021

Tried Data Available Upon Request

NOTES: PO #522-007407

GROSS WT: 23.40kg

NET WT: 4.72kg



CERT 5002.01

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The analytical test results reported on this certificate relate only to the cylinder number specified above. This concludes the test report.

Approved for Release

MULTI-POINT GAS TEST REPORT

Test Date : Dec 8, 2023

Equipment : Gas Analyzer (CO) Model : 48C
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-62460-335/5

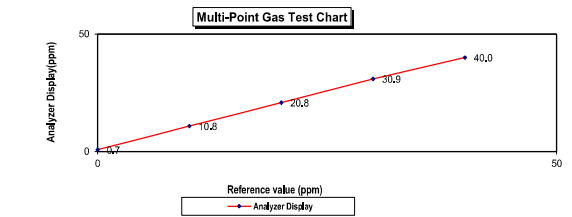
Standard Gas Concentration	Dilutor Detail
Sulphur Dioxide (SO ₂)	41.68 PPM Manufacturer : Thermo Scientific
Nitric Oxide (NO)	45.94 PPM Model : 1461
Methane (CH ₄)	- PPM Serial Number : 1180540071
Carbon Monoxide (CO)	984.8 PPM
Cylinder No. :	EB0143262
Expiration Date :	Jun 20, 2024

Multi-point gas test data

Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.7	0.7	0.7
Level 2 20.00%	10.0	10.8	0.8	7.4
Level 3 40.00%	20.0	20.8	0.8	3.8
Level 4 60.00%	30.0	30.9	0.9	2.9
Level 5 80.00%	40.0	40.0	0.0	0.0

Remark : Measuring Range 50.0 ppm

Average Difference (%) 2.97



Calculate by

8/.....12.....2023

Approve by

8/.....Dec.....2023

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เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : Nov 8, 2023

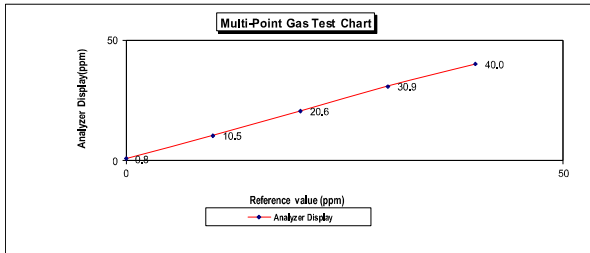
Equipment : Gas Analyzer (CO) Model : 48C
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-62494-335/5

Standard Gas Concentration	Dilutor Detail
Sulphur Dioxide (SO ₂)	41.68 PPM Manufacturer : Thermo Scientific
Nitric Oxide (NO)	45.94 PPM Model : 1461
Methane (CH ₄)	- PPM Serial Number : 1180540071
Carbon Monoxide (CO)	984.8 PPM
Cylinder No. :	EB0143262
Expiration Date :	Jun 20, 2024

Multi-point gas test data

Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.8	0.8	0.8
Level 2 20.00%	10.0	10.5	0.5	4.8
Level 3 40.00%	20.0	20.6	0.6	2.9
Level 4 60.00%	30.0	30.9	0.9	2.9
Level 5 80.00%	40.0	40.0	0.0	0.0

Remark : Measuring Range 50.0 ppm

Acceptable Limit $\pm 5\%$ 

Calculate by

8/.....11.....2023

Approve by

8/.....Nov.....2023

Page 1 of 1

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : Nov 8, 2023

Equipment : Gas Analyzer (CO) Model : 48C
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-69160-362

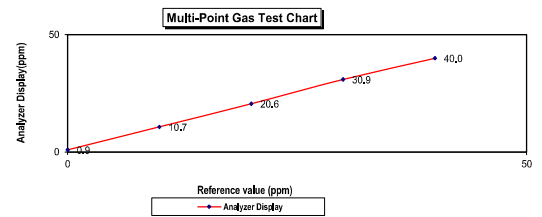
Standard Gas Concentration	Dilutor Detail
Sulphur Dioxide (SO ₂)	41.68 PPM Manufacturer : Thermo Scientific
Nitric Oxide (NO)	45.94 PPM Model : 1461
Methane (CH ₄)	- PPM Serial Number : 1180540071
Carbon Monoxide (CO)	984.8 PPM
Cylinder No. :	EB0143262
Expiration Date :	Jun 20, 2024

Multi-point gas test data

Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.9	0.9	0.9
Level 2 20.00%	10.0	10.7	0.7	6.5
Level 3 40.00%	20.0	20.6	0.6	2.9
Level 4 60.00%	30.0	30.9	0.9	2.9
Level 5 80.00%	40.0	40.0	0.0	0.0

Remark : Measuring Range 50.0 ppm

Average Difference (%) 2.65



Calculate by

8/.....11.....2023

Approve by

8/.....Nov.....2023

Page 1 of 1

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MULTI-POINT GAS TEST REPORT

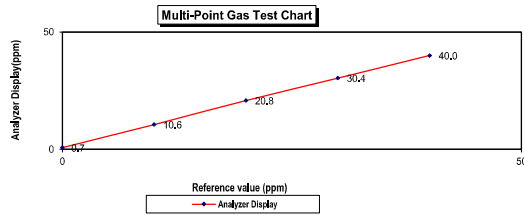
Test Date : Nov 8, 2023

Equipment : Gas Analyzer (CO) Model : 48C
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-73881-375

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model : 1461
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	984.8	PPM	
Cylinder No. :	EB0143262		
Expiration Date :	Jun 20, 2024		

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.7	0.7	0.7
Level 2	20.00%	10.0	10.6	0.6	5.7
Level 3	40.00%	20.0	20.8	0.8	3.8
Level 4	60.00%	30.0	30.4	0.4	1.3
Level 5	80.00%	40.0	40.0	0.0	0.0
Remark : Measuring Range	50.0 ppm		Average Difference (%)	2.30	
:Acceptable Limit \pm 5%					



Calculate by

8 / 11 / 2023

Approve by

8 / Nov / 2023

Page 1 of 1

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

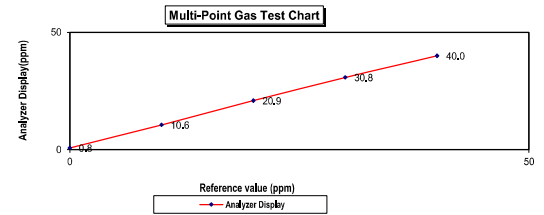
Test Date : Dec 18, 2023

Equipment : Gas Analyzer (CO) Model : 48C
Manufacturer : Thermo Environmental Instruments Serial Number : 48C-71185-368

Standard Gas Concentration		Dilutor Detail	
Sulphur Dioxide (SO ₂)	44.68	PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO)	45.94	PPM	Model : 1461
Methane (CH ₄)	-	PPM	Serial Number : 1180540071
Carbon Monoxide (CO)	984.8	PPM	
Cylinder No. :	EB0143262		
Expiration Date :	Jun 20, 2024		

Multi-point gas test data

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.8	0.8	0.8
Level 2	20.00%	10.0	10.6	0.6	5.7
Level 3	40.00%	20.0	20.9	0.9	4.3
Level 4	60.00%	30.0	30.8	0.8	2.6
Level 5	80.00%	40.0	40.0	0.0	0.0
Remark : Measuring Range	50.0 ppm		Average Difference (%)	2.67	
:Acceptable Limit \pm 5%					



Calculate by

18 / 12 / 2023

Approve by

18 / Dec / 2023

Page 1 of 1

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Airgas Specialty Gases
Airgas USA, LLC
6300 United Drive
Durham, NC 27715
usa@airgas.com

CERTIFICATE OF ANALYSIS Grade of Product: EPA Protocol

Part Number: ED4N190E-5A0105 Reference Number: 122-402135167-1
Cylinder Number: EB0143262 Cylinder Volume: 144.4 CF
Laboratory: 124 - Durham (SAF) - HC Cylinder Pressure: 2015 PSIG
PGVP Number: B2202* Valve Outlet: S60
Gas Code: CO, NO, NOX, SC2, BALN Certification Date: Jun 21, 2021
Expiration Date: Jun 21, 2024

Certificate performed in accordance with EPA Testability Protocol for Analytical Equipment of Gas and Calibration Standards (May 2012) and EPA GC/MS-1618-1, using the assay procedures under Applied Technology does not require cylinder for analytical verification. The cylinder has a total weight of 100.00 lbs. The cylinder is not to be used for the use of this calibration certificate. All concentrations are in mg/L. Do Not Use "as Calibrated" Weight: 1.0 g. 0.7 mg/gallon.

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Date
NOX	45.00 PPM	45.86 PPM	G1	+/- 1.4% NIST Traceable	08/14/2021, 08/12/2021
NI/NI OXIDE	45.00 PPM	45.86 PPM	G1	+/- 1.4% NIST Traceable	08/14/2021, 08/12/2021
SULFUR DIOXIDE	45.00 PPM	44.50 PPM	G1	+/- 1.0% NIST Traceable	08/14/2021, 08/12/2021
CARBON MONOXIDE	1000 PPM	984.8 PPM	G1	+/- 0.7% NIST Traceable	08/14/2021
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTM	2001110	CC100008	45.86 PPM NITROGEN DIOXIDE/NITROGEN	+/- 1.0%	Feb 02, 2025
PRM	2786	CC65055	9.91 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.3%	Feb 20, 2020
GMS	40142302102	CC65055	4.345 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.1	Feb 18, 2023
NTM	1001104	CC473277	45.00 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Jun 17, 2022
NTM	1403118	CC473277	395.0 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Nov 15, 2025

Instrument/Make/Model	Analytical Principle	Last Multi-point Calibration
N code: 9700 AFR800-333 CO	FTIR	Jun 03, 2021
N code: 9700 AFR800-333 NO	FTIR	Jun 03, 2021
N code: 9700 AFR800-333 NO2	FTIR	Jun 03, 2021
N code: 9700 AFR800-333 SO2	FTIR	Jun 03, 2021

Test Data Available Upon Request

NOTES: PO #322-007607
GROSS WT: 23.40kg
NET WT: 4.72kg



The analytical test results reported on this certificate relate only to the cylinder number specified above. This includes the test report.

Approved for Release



CERT 3002-01
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THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau
Date of Issue : 22 February, 2024 Certification No. 098/24
Page : 1 of 5

Object : Wind Speed & Wind Direction Data Logger

Manufacturer : SCARLET/TECH

Type : WL-21

Mfg Code : Wireless Receiver : 2111DR0052

Wind Sensor : 2111DT0052

Customer : United Analyst and Engineering Consultant Co., Ltd.

B1 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature : 25.1 °C Barometric Pressure : 1009.5 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Aft Plotting Board

: Micromanometer : Theodor Friedrichs FC014 Serial No. 9310119 : HOOK GAGE NO 1425

N.I.S.T. Test Reference Number 731241460 : Standard Velocity at 20 - 30 m/sec

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

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

STANDARD THERMOMETER : Theodor Friedrichs : Dry No.8390/94 Wet No. 8399/94

: testo, testo 645 Serial No. 02648057 : Thermoschneider No.918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

: Digital Barometer Vaisala Type PTB350 No. V1220001

Calibrated by : Notarop Signed : (Authorized Signatory)

Mr. Watcharapong Subwat Mr. Pisod Prommat for the Chief

Mechanical Engineer Sub-Standard Instrument

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The Result of Calibration

Certification No. 098/24

Page : 3 of 5

22 February, 2024

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mbar
1010.84	1011	-0.16
1010.60	1010	0.00
1011.71	1012	-0.29
1012.17	1012	-0.17
1012.31	1012	0.31
1012.26	1012	0.25
1012.79	1013	-0.21
1012.95	1012	0.95
1013.52	1014	-0.48
1014.16	1014	0.16
1015.79	1016	-0.21
1016.02	1016	0.02
1016.86	1016	-0.14
1016.69	1015	0.69
1011.51	1012	-0.49
1011.80	1012	-0.20
1012.06	1012	0.06
1012.81	1013	-0.19
1013.22	1013	0.22
1013.49	1013	0.49
Average		0.08

Calibrated by :

Mr. Watcharapol Subwat
Mechanical EngineerCalibration & Test Section
Meteorological Instruments Bureau

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เอกสารไม่ควบคุม



The Result of Calibration

Certification No. 098/24

Page : 2 of 5

22 February, 2024

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
	m/sec	inches H2O	inches H2O	m/sec	m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.04	-	-	-	7.0	0.04
9.02	-	-	-	9.0	0.02
11.02	-	-	-	11.0	0.02
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	0.01
17.02	-	-	-	16.9	0.12
20.02	-	-	-	19.9	0.12

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

Calibrated by :

Mr. Watcharapol Subwat
Mechanical EngineerCalibration & Test Section
Meteorological Instruments Bureau

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The Result of Calibration

Certification No. 098/24

22 February, 2024

Page : 4 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mmHg
758.19	758	0.19
758.01	758	0.01
758.84	759	-0.16
759.19	759	0.19
759.29	759	0.29
759.25	759	0.25
759.65	760	-0.35
759.77	760	-0.23
760.20	760	0.20
760.68	760	0.68
761.90	762	-0.10
762.08	762	0.08
761.96	762	-0.04
761.83	762	-0.17
758.69	759	-0.31
758.91	759	-0.09
759.11	759	0.11
759.57	760	-0.33
759.98	760	-0.02
760.18	760	0.18
Average		0.02

Calibrated by :

Mr. Watcharapol Subwat
Mechanical EngineerCalibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม



The Result of Calibration

Certification No. 098/24

Page : 5 of 5

22 February, 2024

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45	0.2
30.3	30	0.3
15.8	15	0.8

Calibrated by :

Mr. Watcharapol Subwat
Mechanical EngineerCalibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 13 March, 2024

Certification No. 121/24

Page : 1 of 5

Object : Wind Speed & Wind Direction Data Logger

Manufacturer : SCARLET/TECH

Type : WL-21

Mfg Code : Wireless Receiver 2111DR0058

Wind Sensor 2111DT0058

Customer : United Analyst and Engineering Consultant Co.,Ltd.

81 Soi Udumsuk 41, Sukhumvit Road,

Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1011.9 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Aloft Plotting Board

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119 : HOOK GAGE NO 1425

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

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

Serial Number 110730029 (sensor 120629586)


JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

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

: testo, testo 845 Serial No. 02848057 : Thermoschneider No.918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

: Digital Barometer Vaisala Type PTB330 No. P4390001

Calibrated by : 

Signed : 

(Authorised Signatory

for the Chief

Sub-Standard Instrument

Mr. Watcharapol Subwat

Mr. Pisood Promsat

Mechanical Engineer

Sub-Standard Instrument

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

13 March, 2024

Certification No. 121/24

Page : 2 of 5

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer	mmHg H2O	mmHg H2O	m/sec	m/sec	m/sec
m/sec					
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.04	-	-	-	7.0	0.04
9.02	-	-	-	8.9	0.12
11.02	-	-	-	11.0	0.02
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.9	0.12

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

Calibrated by : 

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 121/24

13 March, 2024

Page : 3 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mbar
1009.59	1009	0.59
1009.45	1010	-0.55
1010.10	1010	0.10
1010.94	1011	-0.06
1011.46	1011	0.46
1011.84	1012	-0.16
1012.06	1012	0.06
1013.04	1013	0.04
1013.18	1013	0.18
1012.89	1013	-0.11
1013.20	1013	0.20
1013.44	1013	0.44
1013.81	1014	-0.19
1014.19	1014	0.19
1015.96	1016	-0.04
1016.23	1016	0.23
1015.64	1015	0.64
1015.23	1015	0.23
1012.87	1013	-0.13
1013.63	1014	-0.37

Average

-0.09

Calibrated by : 

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

13 March, 2024

Certification No. 121/24

Page : 4 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mmHg
757.25	757	0.25
757.15	757	0.15
757.64	758	-0.36
758.27	758	0.27
758.66	758	0.66
758.94	759	-0.06
759.11	759	0.11
759.84	760	-0.16
759.95	760	-0.05
759.73	760	-0.27
759.96	760	-0.04
760.14	760	0.14
760.42	761	-0.58
760.70	761	-0.30
762.03	762	0.03
762.24	762	0.24
761.78	762	-0.21
761.48	762	-0.52
759.71	760	-0.29
760.28	760	0.28

Average

-0.03

Calibrated by : 

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

13 March, 2024

Certification No. 121/24

Page : 5 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.1	45	0.1
30.2	30	0.2
15.4	16	-0.6

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau



เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 22 February, 2024

Certification No. 097/24

Page : 1 of 5

Object : Wind Speed & Wind Direction Data Logger

Manufacturer : SCARLET/TECH

Type : WL-21

Mfg Code : Wireless Receiver 2112DR0065

Wind Sensor 2112DT0065

Customer : United Analyst and Engineering Consultant Co.,Ltd.

81 Soi Udomsuk 41, Sukhumvit Road,

Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1009.8 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Airt Plotting Board

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119 : HOOK GAGE NO 1425

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

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

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

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

: testo, testo 645 Serial No. 02648057 : ThermoSchneider No. 918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. Y1220015

: Digital Barometer Vaisala Type PTB320 No. K4360001

Calibrated by :

Mr. Watcharapol Subwat

Mechanical Engineer

Signed :

Mr. Pitsod Promsat

(Authorized Signatory)

for the Chief

Sub-Standard Instrument

เอกสารไม่ควบคุม

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The Result of Calibration

Certification No. 097/24

22 February, 2024

Page : 4 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mmHg
758.19	758	0.19
758.01	758	0.01
758.84	758	0.84
759.19	759	0.19
759.29	759	0.29
759.25	759	0.25
759.65	759	0.65
759.77	760	-0.23
760.20	760	0.20
760.68	760	0.68
761.90	762	-0.10
762.08	762	0.08
761.96	762	-0.04
761.83	762	-0.17
758.69	759	-0.31
758.91	759	-0.09
759.11	759	0.11
759.67	760	-0.33
759.98	760	-0.02
760.18	760	0.18

Average 0.12

Calibrated by:
Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม



The Result of Calibration

Certification No. 097/24

22 February, 2024

Page : 5 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45	0.2
30.3	30	0.3
15.8	16	-0.2

Calibrated by:
Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม



Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 13 March, 2024

Certification No. 123/24

Page : 1 of 5

Object : Wind Speed & Wind Direction Data Logger

Manufacturer : SCARLET/TECH

Type : WL-21

Mfg Code : Wireless Receiver 2311DR0037
Wind Sensor 2112DT0102

Customer : United Analyst and Engineering Consultant Co.,Ltd.
81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1013.1 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Aloft Plotting Board

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119 : HOOK GAGE NO. 1425

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

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

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

: testo, testo 045 Serial No. 02848057 : Thermoschneider No.918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015

: Digital Barometer Vaisala Type PTB330 No. V4300001

Calibrated by:
Mr. Watcharapol Subwat
Mechanical Engineer

Signed:
Mr. Pisoon Promsat
Sub-Standard Instruments

(Authorized Signatory)
for the Chief
Sub-Standard Instruments

เอกสารไม่ควบคุม



The Result of Calibration

Certification No. 123/24

13 March, 2024

Page : 2 of 5

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches Hg	Vacuum inches Hg	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.04	-	-	-	6.9	0.14
9.02	-	-	-	9.0	0.02
11.02	-	-	-	10.9	0.12
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

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

Calibrated by:
Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม



The Result of Calibration

Certification No. 123/24

13 March, 2024

Page : 3 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mbar
1009.59	1009	0.59
1009.45	1009	0.45
1010.10	1010	0.10
1010.94	1011	-0.06
1011.46	1011	0.46
1011.84	1012	-0.16
1012.06	1012	0.06
1013.04	1013	0.04
1013.18	1013	0.18
1012.89	1013	-0.11
1013.20	1013	0.20
1013.44	1014	-0.56
1013.61	1014	-0.19
1014.19	1014	0.19
1015.96	1016	-0.04
1016.23	1016	0.23
1015.64	1016	-0.36
1015.23	1015	0.23
1012.87	1013	-0.13
1013.63	1013	0.63

Average

0.09

Calibrated by:

Watcharapol

Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau



เอกสารไม่ควบคุม



The Result of Calibration

Certification No. 123/24

13 March, 2024

Page : 4 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mmHg
757.25	757	0.25
757.15	757	0.15
757.64	758	-0.36
758.27	758	0.27
758.66	759	-0.34
758.94	759	-0.06
759.11	759	0.11
759.84	760	-0.16
759.95	760	-0.05
759.73	760	-0.27
759.96	760	-0.04
760.14	760	0.14
760.42	760	0.42
760.70	761	-0.30
762.03	762	0.03
762.24	762	0.24
761.79	762	-0.21
761.48	761	0.48
759.71	760	-0.29
760.28	760	0.28

Average

0.02

Calibrated by:

Watcharapol

Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau



เอกสารไม่ควบคุม



The Result of Calibration

Certification No. 123/24

13 March, 2024

Page : 5 of 5

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.1	45	0.1
30.2	30	0.2
15.4	15	0.4

Calibrated by:

Watcharapol

Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau



เอกสารไม่ควบคุม



Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 13 March, 2024

Certification No. 122/24

Page : 1 of 5

Object : Wind Speed & Wind Direction Data Logger

Manufacturer : SCARLET/TECH

Type : WL-21

Mfg Code : Wireless Receiver 2205DRD008
Wind Sensor 2205DT0008Customer : United Analyst and Engineering Consultant Co.,Ltd.
81 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Prakanong, Bangkok 10260.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1012.5 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Aloft Plotting Board

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119 : HOOK GAUGE NO 1425

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

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

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

: testo, testo 645 Serial No. 02849057 : ThermoSchneider No.918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB224 No. Y4220015

: Digital Barometer Vaisala Type PTB330 No. Y4320001

Calibrated by:

Watcharapol

Mr. Watcharapol Subwat
Mechanical Engineer

Signed:

Mr. Pisod Promsat

(Authorized Signatory)

for the Chief

Sub-Standard Instrument

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 122/24

13 March, 2024

Page : 2 of 5

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
	m/sec	inches H2O	inches H2O	m/sec	m/sec
1.00	-	-	-	1.0	0.00
3.02	-	-	-	3.0	0.02
5.00	-	-	-	5.0	0.00
7.04	-	-	-	7.0	0.04
9.02	-	-	-	8.9	0.12
11.02	-	-	-	11.0	0.02
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.9	0.11
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.0	0.02

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

Calibrated by:
Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 122/24

13 March, 2024

Page : 3 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mbar
1009.59	1009	0.59
1009.45	1009	0.45
1010.10	1010	0.10
1010.94	1011	-0.06
1011.46	1012	-0.54
1011.84	1012	-0.16
1012.06	1012	0.06
1013.04	1013	0.04
1013.18	1013	0.18
1012.89	1013	-0.11
1013.20	1013	0.20
1013.44	1013	0.44
1013.81	1014	-0.19
1014.19	1014	0.19
1015.96	1016	-0.04
1016.23	1016	0.23
1015.64	1015	0.64
1015.23	1015	0.23
1012.67	1013	-0.13
1013.63	1013	0.63

Average 0.14

Calibrated by:
Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 122/24

13 March, 2024

Page : 4 of 5

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	mmHg
757.25	757	0.25
757.15	757	0.15
757.64	758	-0.36
758.27	758	0.27
758.66	759	-0.34
758.94	759	-0.06
759.11	759	0.11
759.84	760	-0.16
759.95	760	-0.05
759.73	760	-0.27
759.96	760	-0.04
760.14	760	0.14
760.42	760	0.42
760.70	761	-0.30
762.03	762	0.03
762.24	762	0.24
761.79	762	-0.21
761.48	762	-0.52
759.71	760	-0.29
760.28	760	0.28

Average 0.03

Calibrated by:
Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 122/24

13 March, 2024

Page : 5 of 5

Standard Temp.	Temperature Sensor Reading	
	Reading	Correction
°C	°C	°C
45.1	45	0.1
30.2	30	0.2
15.4	15	0.4

Calibrated by:
Mr. Watcharapol Subwat
Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING
CONSULTANT CO.,LTD.
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Prakanong, Bangkok 10260

Certificate No : 23-ACT-118
Request No : Req-2023-1547

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 2
Manufacturer : LARSON DAVIS Range : 94 , 114 dB / 1000 Hz
Model : CAL150 Instrument Status : Used
Serial Number : 6171
ID : UAE.EFM.117/2562

Calibration Environment and Details


Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 21 July 2023
Calibration Date : 4 August 2023
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators


Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEL	31 May 2024
THD Multimeter	2015	1047765	NIMT	31 January 2024

Traceability : This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

Note

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

Calibrated By : 
Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 4 August 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
(M-705) Rev. 1.0 (Rev. 1.0) (Date: 01/01/2023)

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Certificate No : 23-ACT-118
Request No : Req-2023-1547

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 2 (± dB)
	Measured	Error	Measured	Error		
94 dB / 1000 Hz	94.14	0.14	-	-	0.13	0.40
114 dB / 1000 Hz	114.15	0.15	-	-	0.13	0.40

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 2 (± %)
	Measured (Hz)	Error (%)	Measured (Hz)	Error (%)		
94 dB / 1000 Hz	1000.00	0.00	-	-	0.01	1.7
114 dB / 1000 Hz	1000.00	0.00	-	-	0.01	1.7

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 2 (± %)
	Measured (%)		Measured (%)			
94 dB / 1000 Hz	0.04		-		0.40	3.0
114 dB / 1000 Hz	0.20		-		0.40	3.0

Note :

- Acceptance limit was IEC60942:2017 Class 1
- The calibration results exclude the calibrator pressure correction
- The calibration results exclude the microphone volume correction

End of Calibration

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
(M-705) Rev. 1.0 (Rev. 1.0) (Date: 01/01/2023)

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok
10260

Certificate No : 23-SLM-210
Request No : Req-2023-1387

Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 2
Manufacturer : LARSON DAVIS Microphone Model : 375A04
Model : LX72 Microphone S/N : 346386
Serial Number : 0005293 Preamplifier Model : PRMLxT2B
ID : UAE.EFM.108/2562 Preamplifier S/N : 056084
Resolution : 0.1 dB Instrument Status : Used

Calibration Environment and Details


Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 21 June 2023
Calibrated Date : 23 June 2023
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3: 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	29 June 2023	TSI
Audio Generator	Svante	Svan401	131	12 October 2023	WK Electric

Note

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

Calibrated By : 
Mr. Noppadon Luangart
Calibration Officer

Approved By : 
Mr. Pacit Mathavorn
Calibration Engineer Supervisor
Issue Date : 23 June 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
เอกสารไม่ควบคุม

Certificate No : 23-SLM-210
Request No : Req-2023-1387

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
FAST / A / 37-139							
Calibrator Setting							
1000 Hz 114 dB	114.54	114.5	-0.04	114.5	-0.04	0.2	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand JM, Model AC-300, SN, AC-300001087

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	24.1	0.1

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	23.5	0.1
C	23.0	0.1
Z	27.5	0.1

4. Acoustic signal test of frequency weightings

(Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A	C	Z		
FAST / 37-139					
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.0	0.1	0.1	0.6	2.0
1000 Hz	0.0	0.0	0.0	0.6	3.0
4000 Hz	0.0	0.0	0.1	0.6	3.0
8000 Hz	-0.6	-0.6	-0.5	0.7	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.
เอกสารไม่ควบคุม

Certificate No : 23-SLM-210
Request No : Req-2023-1387

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A (dB)	C (dB)	Z (dB)		
FAST / 37-139					
STD Setting					
63 Hz	-0.2	-0.1	-0.1	0.2	2.0
125 Hz	-0.1	0.0	-0.1		1.5
250 Hz	-0.1	-0.1	-0.1		1.5
500 Hz	-0.1	0.0	-0.1		1.5
1000 Hz	0.0	0.0	-0.1		1.0
2000 Hz	0.0	0.0	0.0		2.0
4000 Hz	0.0	0.0	0.0		2.0
8000 Hz	-0.1	-0.1	0.0		5
16000 Hz	-0.1	-0.1	-0.1		+5, -INF.

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		REF	UUC	ERR	
FAST / 37-139					
UUC Weighting	(dB)	(dB)	(dB)		
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		REF	UUC	ERR	
37-139 / A					
UUC Time Response	(dB)	(dB)	(dB)		
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Loq	114.00	114.0	0.0		0.1

The results related only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-210
Request No : Req-2023-1387

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.3

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		REF	UUC	ERR	
FAST / A / 37-139					
STD dB	(dB)	(dB)	(dB)		
139.00	139	139.0	0.0	0.3	1.1
134.00	134	134.0	0.0		1.1
129.00	129	129.0	0.0		1.1
124.00	124	124.0	0.0		1.1
119.00	119	119.0	0.0		1.1
114.00	114	114.0	0.0		1.1
109.00	109	109.0	0.0		1.1
104.00	104	104.0	0.0		1.1
99.00	99	99.0	0.0		1.1
94.00	94	93.9	-0.1		1.1
89.00	89	88.9	-0.1		1.1
84.00	84	83.9	-0.1		1.1
79.00	79	78.9	-0.1		1.1
74.00	74	73.9	-0.1		1.1
69.00	69	68.9	-0.1		1.1
64.00	64	63.9	-0.1		1.1
59.00	59	58.9	-0.1		1.1
54.00	54	53.9	-0.1		1.1
49.00	49	49.0	0.0		1.1
44.00	44	44.0	0.0		1.1
39.00	39	39.1	0.1		1.1
34.00	34	34.1	0.1		1.1

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เอกสารไม่ควบคุม

Certificate No : 23-SLM-210
Request No : Req-2023-1387

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		REF	UUC	ERR	
FAST / A					
UUC Range	(dB)	(dB)	(dB)		
37-139					
	39.3	39.5	0.2	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
			Ref	UUC	ERR	
A / 37-139						
UUC Time Response	(ms)	(dB)	(dB)	(dB)		
Fast	200	135.0	135.0	0.0	0.2	1
	2	118.0	117.9	-0.1		+1.0, -2.5
	0.25	109.0	108.6	-0.4		+1.5, -5.0
Slow	200	128.6	128.5	-0.1		1
	2	109.0	108.9	-0.1		+1.0, -5.0
	200	129.0	129.0	0.0		1
SEL	2	109.0	109.1	+0.1		+1.0, -2.5
	0.25	100.0	99.8	-0.2		+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		REF	UUC	ERR	
FAST / C / 95-142					
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	137.4	136.6	-0.80	0.2	3.0
Positive half cycle	136.4	136.2	-0.20		2.0
Negative half cycle	136.4	136.2	-0.20		2.0

The results related only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-210
Request No : Req-2023-1387

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)		
Positive one-half cycle	142.5		
Negative one-half cycle	142.7		
Deviated	-0.2	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)		
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.3

End of Certificate

The results related only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 23-SLM-222
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Prakanung, Bangkok Request No : Req-2023-1410
10260

Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 2
Manufacturer : LARSON DAVIS Microphone Model : 375B02
Model : LxT2 Microphone S/N : 011736
Serial Number : 0005294 Preamplifier Model : PRMLA72B
ID : UAE-EFM.109.2562 Preamplifier S/N : 056903
Resolution : 0.1 dB Instrument Status : Used

Calibration Environment and Details


Temperature : 23 °C ± 2 °C
Humidity : 59 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 26 June 2023
Calibrated Date : 28 June 2023
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic


Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multifrequency Calibrator	Qseol	Qseol-cal	EFA000234	29 June 2023	TSI
Audio Generator	Svanck	Svan401	131	12 October 2023	WK Electric

Note

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

Calibrated By : 
Mr. Noppadon Luangari
Calibration Officer

Approved By : 
Mr. Paet Mathavorn
Calibration Engineer Supervisor
Issue Date : 28 June 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-222
Request No : Req-2023-1410

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
1000 Hz 114 dB	113.77	114.0	+0.23	113.8	+0.03	0.2	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTER, Model SV 35A, SN. 73246

2. Self-generated noise, Microphone installed

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / A / 37-139		
UUC Weighting	(dB)	(± dB)
A	30.5	0.1

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

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 37-139		
UUC Weighting	(dB)	(± dB)
A	30.0	0.1
C	29.6	0.1
Z	33.8	0.1

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A (dB)	C (dB)	Z (dB)		
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
125 Hz	0.1	0.1	0.1	0.6	2.0
1000 Hz	0.0	0.0	0.0	0.6	1.0
4000 Hz	1.1	1.1	1.1	0.6	3.0
8000 Hz	2.7	2.7	2.7	0.7	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-222
Request No : Req-2023-1410

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A (dB)	C (dB)	Z (dB)		
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
63 Hz	-0.1	0.0	0.0	0.2	2.0
125 Hz	-0.1	0.1	0.0	0.2	1.5
250 Hz	0.0	0.0	0.0	0.2	1.5
500 Hz	0.0	0.1	0.0	0.2	1.5
1000 Hz	0.0	0.0	0.0	0.2	1.0
2000 Hz	0.1	0.1	0.0	0.2	2.0
4000 Hz	0.0	0.0	0.0	0.2	3.0
8000 Hz	0.0	0.0	0.1	0.2	5
16000 Hz	0.0	-0.1	-0.1	0.2	+5, -INF

6. Frequency and time weightings at 1kHz

UUC Setting	STD REF	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	(± dB)
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0	0.2	0.2
Z	114.00	114.0	0.0	0.2	0.2

UUC Setting	STD REF	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
37-139 / A	(dB)	(dB)	(dB)	(± dB)	(± dB)
UUC Time Response	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0	0.2	0.1
Leq	114.00	114.0	0.0	0.2	0.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-222
Request No : Req-2023-1410

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 37-139	UUC		
STD Setting	(dB)	(± dB)	(± dB)
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.2

8. Level linearity on the reference level range

UUC Setting	Anticipated REF	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
FAST / A / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)
143.00	143	142.9	-0.1	0.3	0.8
138.00	139	139.0	0.0	0.3	1.1
134.00	134	134.0	0.0	0.3	1.1
128.00	129	129.0	0.0	0.3	1.1
124.00	124	124.0	0.0	0.3	1.1
118.00	119	119.0	0.0	0.3	1.1
114.00	114	114.0	0.0	0.3	1.1
108.00	109	109.0	0.0	0.3	1.1
104.00	104	104.0	0.0	0.3	1.1
99.00	99	99.0	0.0	0.3	1.1
94.00	94	94.0	0.0	0.3	1.1
89.00	89	89.0	0.0	0.3	1.1
84.00	84	84.0	0.0	0.3	1.1
79.00	79	79.0	0.0	0.3	1.1
74.00	74	74.0	0.0	0.3	1.1
69.00	69	69.0	0.0	0.3	1.1
64.00	64	64.0	0.0	0.3	1.1
59.00	59	59.0	0.0	0.3	1.1
54.00	54	54.0	0.0	0.3	1.1
49.00	49	49.1	0.1	0.3	1.1
44.00	44	44.2	0.2	0.3	1.1
43.00	43	43.2	0.2	0.3	1.1
42.00	42	42.4	0.4	0.3	1.1
41.00	41	41.3	0.3	0.3	1.1
40.00	40	40.5	0.5	0.3	1.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-222

Request No : Req-2023-1410

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
		UUC	ERR		
FAST / A	REF	(dB)	(dB)	(± dB)	Limit
UUC Range	(dB)	(dB)	(dB)	(± dB)	(± dB)
37-139	45.4	45.6	0.2	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
			UUC	ERR		
A / 37-139	Toneburst	Ref	(dB)	(dB)	(± dB)	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	200	135.0	135.0	0.0	0.2	1
	2	118.0	117.6	-0.4		+1.0, -2.5
	0.25	109.0	108.5	-0.5		+1.5, -5.0
Slow	200	128.6	128.5	-0.1		1
	2	109.0	108.9	-0.1		+1.0, -5.0
	200	129.0	129.0	0.0		1
SEL	2	109.0	108.9	-0.1	0.2	+1.0, -2.5
	0.25	100.0	99.7	-0.3		+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance
		UUC	ERR		
FAST / C / 95-142	REF	(dB)	(dB)	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
Complete cycle	137.4	136.7	-0.70	0.2	3.0
Positive half cycle	136.4	136.2	-0.20		2.0
Negative half cycle	136.4	136.2	-0.20		2.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-222

Request No : Req-2023-1410

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		
STD Setting	(dB)	(± dB)	(± dB)
Positive one-half cycle	144.5		
Negative one-half cycle	144.5		
Deviated	0.0	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		
STD Setting	(dB)	(± dB)	(± dB)
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.3

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Certificate No : 23-SLM-209

Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260

Request No : Req-2023-1386

Unit Under Calibration Details

Measurement Item : Sound Level Meter

Microphone Class : 2

Manufacturer : LARSON DAVIS

Microphone Model : 375062

Model : LxT2

Microphone S/N : 011739

Serial Number : 0005206

Preamplifier Model : PRMLX2B

ID : UAIEFM111U2562

Preamplifier S/N : 056086

Resolution : 0.1 dB

Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C

Humidity : 50 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 21 June 2023

Calibrated Date : 23 June 2023

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


Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multifrequency Calibrator	Quest	Quest-cel	EFA000234	29 June 2023	TSI
Audio Generator	Sonoth	Son401	131	12 October 2023	WK Electric

Note

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

Calibrated By : 
Mr. Noppadon Luangrat
Calibration Officer

Approved By : 
Mr. Paet Muthavorn
Calibration Engineer Supervisor
Issue Date : 23 June 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-209

Request No : Req-2023-1386

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance
		UUC	ERR	UUC	ERR		
FAST / A / 37-139	Level	(dB)	(dB)	(dB)	(dB)	(± dB)	Limit
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)
1000 Hz 114 dB	114.54	114.6	+0.06	114.5	-0.04	0.2	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand 3M, Model AC-300, SN. AC-300001087

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting	(dB)	(± dB)
A	29.9	0.1

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting	(dB)	(± dB)
A	29.7	0.1
C	29.0	0.1
Z	33.4	0.1

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
	A	C	Z		
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
125 Hz	0.1	0.1	0.1	0.6	2.0
1000 Hz	0.0	0.0	0.0	0.6	1.0
4000 Hz	1.0	1.0	1.0	0.6	3.0
8000 Hz	2.0	1.9	2.0	0.7	5.0

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เอกสารไม่ควบคุม

Certificate No : 23-SLM-209
Request No : Req-2023-1386

Certificate No : 23-SLM-209
Request No : Req-2023-1386

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance
FAST / 37-139	Weighting Response curve:				Limit
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)
63 Hz	-0.2	-0.1	-0.1	0.2	2.0
125 Hz	-0.1	0.0	-0.1		1.5
250 Hz	-0.1	-0.1	-0.1		1.5
500 Hz	-0.1	0.0	-0.1		1.5
1000 Hz	0.0	0.0	-0.1		1.0
2000 Hz	0.0	0.0	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	-0.1	-0.1	0.0		5
16000 Hz	-0.1	-0.1	-0.1		+5,-INF

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
		REF	ERR		
FAST / 37-139					
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	(± dB)
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
		REF	ERR		
37-139 / A	(dB)	(dB)	(dB)	(± dB)	(± dB)
UUC Time Response					
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Lsq	114.00	114.0	0.0		0.1

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เอกสารไม่ควบคุม

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	114.0		
Final	114.0		
Deviated	0.0		

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance
		REF	ERR		
FAST / A / 37-139					
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)
139.00	139	139.0	0.0	0.3	1.1
134.00	134	134.0	0.0		1.1
129.00	129	129.0	0.0		1.1
124.00	124	124.0	0.0		1.1
119.00	119	119.0	0.0		1.1
114.00	114	114.0	0.0		1.1
109.00	109	109.0	0.0		1.1
104.00	104	104.0	0.0		1.1
99.00	99	99.0	0.0		1.1
94.00	94	94.0	0.0		1.1
89.00	89	89.0	0.0		1.1
84.00	84	84.0	0.0		1.1
79.00	79	79.0	0.0		1.1
74.00	74	74.0	0.0		1.1
69.00	69	69.0	0.0		1.1
64.00	64	64.0	0.0		1.1
59.00	59	59.0	0.0		1.1
54.00	54	54.1	0.1		1.1
49.00	49	49.1	0.1		1.1
44.00	44	44.2	0.2		1.1
39.00	39	39.5	0.5		1.1

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เอกสารไม่ควบคุม

Certificate No : 23-SLM-209
Request No : Req-2023-1386

Certificate No : 23-SLM-209
Request No : Req-2023-1386

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
		REF	ERR		
FAST / A					
UUC Range	(dB)	(dB)	(dB)	(± dB)	(± dB)
37-139	44.7	44.8	0.1	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
			Ref	ERR		
A / 37-139						
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	200	135.0	134.9	-0.1	0.2	1
	2	118.0	117.6	-0.4		+1.0, -2.5
	0.25	109.0	108.6	-0.4		+1.5, -5.0
Slow	200	128.6	128.4	-0.2		1
	2	109.0	108.8	-0.2		+1.0, -5.0
	200	129.0	129.0	0.0		1
SEL	2	109.0	108.8	-0.2		+1.0, -2.5
	0.25	100.0	99.8	-0.2		+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance
		REF	ERR		
FAST / C / 95-142					
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
Complete cycle	137.4	136.8	-0.60	0.2	3.0
Positive half cycle	136.4	136.2	-0.20		2.0
Negative half cycle	136.4	136.2	-0.20		2.0

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เอกสารไม่ควบคุม

Certificate No : 23-SLM-209
Request No : Req-2023-1386

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Positive one-half cycle	143.8		
Negative one-half cycle	143.9		
Deviated	-0.1	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	138.0		
Final	138.0		
Deviated	0.0		

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD. Certificate No : 23-SLM-225
Address : 81 Soi Udomsak 41, Sukhumvit Road, Bangkok, Prakanong, Bangkok Request No : Req-2023-1413
10260

Unit Under Calibration Details

Measurement Item : Sound Level Meter Microphone Class : J
Manufacturer : LARSON DAVIS Microphone Model : 375B02
Model : LxT2 Microphone S/N : 011769
Serial Number : 0005305 Preamplifier Model : PRMLxT2B
ID : UAE-EFM.116/2562 Preamplifier S/N : 056100
Resolution : 0.1 dB Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 26 June 2023
Calibrated Date : 28 June 2023
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	29 June 2023	TSI
Audio Generator	Swanick	Swan401	131	12 October 2023	WK Electric

Note

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

Calibrated By : 

Mr. Neppadon Luangut
Calibration Officer

Approved By : 

Mr. Paitt Mallavorn
Calibration Engineer Supervisor

Issue Date : 28 June 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Calibration Lab. **เอกสารไม่ควบคุม**

Certificate No : 23-SLM-225

Request No : Req-2023-1413

1. Indication at the calibration check frequency

UUC Setting FAST / A / 37-139	Nominal Level (dB)	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
1000 Hz (14 dB)	113.77	114.0	+0.23	113.8	+0.01	0.2	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 73246

2. Self-generated noise, Microphone installed

UUC Setting FAST / 37-139	Measured (dB)	UNCERTAINTY (± dB)
UUC Weighting		
A	30.9	0.1

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

UUC Setting FAST / 37-139	Measured (dB)	UNCERTAINTY (± dB)
UUC Weighting		
A	30.6	0.1
C	30.1	0.1
Z	34.5	0.1

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

UUC Setting FAST / 37-139	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A (dB)	C (dB)	Z (dB)		
STD Setting					
125 Hz	0.0	0.1	0.0	0.6	2.0
1000 Hz	0.0	0.0	0.0	0.6	1.0
4000 Hz	1.0	1.1	1.0	0.6	3.0
8000 Hz	2.1	2.1	2.1	0.7	5.0

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Certificate No : 23-SLM-225

Request No : Req-2023-1413

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

UUC Setting FAST / 37-139	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A (dB)	C (dB)	Z (dB)		
STD Setting					
63 Hz	-0.2	0.0	0.0	0.2	2.0
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	-0.1	0.0	0.0		1.5
500 Hz	-0.1	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.0	0.0	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	0.0	0.0	0.0		5
16000 Hz	-0.1	-0.1	-0.1		+5, -INF.

6. Frequency and time weightings at 1kHz

UUC Setting FAST / 37-139	STD REF	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
UUC Weighting	(dB)	UUC (dB)	ERR (dB)		
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting 37-139 / A	STD REF	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
UUC Time Response	(dB)	UUC (dB)	ERR (dB)		
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Leq	114.00	114.0	0.0		0.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Calibration Lab. **เอกสารไม่ควบคุม**

Certificate No : 23-SLM-225

Request No : Req-2023-1413

7. Long Term Stability

UUC Setting FAST / A / 37-139	Measured UUC (dB)	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
STD Setting			
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.3

8. Level linearity on the reference level range

UUC Setting FAST / A / 37-139	Anticipated REF (dB)	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
STD dB	(dB)	UUC (dB)	ERR (dB)		
143.00	143	143.0	0.0	0.3	0.8
129.00	129	129.0	0.0		1.1
124.00	124	124.0	0.0		1.1
129.00	129	129.0	0.0		1.1
124.00	124	124.0	0.0		1.1
119.00	119	119.0	0.0		1.1
114.00	114	114.0	0.0		1.1
109.00	109	109.0	0.0		1.1
104.00	104	104.0	0.0		1.1
99.00	99	98.9	-0.1		1.1
94.00	94	94.0	0.0		1.1
89.00	89	89.0	0.0		1.1
84.00	84	84.0	0.0		1.1
79.00	79	79.0	0.0		1.1
74.00	74	74.0	0.0		1.1
69.00	69	69.0	0.0		1.1
64.00	64	64.0	0.0		1.1
59.00	59	59.0	0.0		1.1
54.00	54	54.0	0.0		1.1
49.00	49	49.1	0.1		1.1
44.00	44	44.2	0.2		1.1
43.00	43	43.2	0.2		1.1
42.00	42	42.3	0.3		1.1
41.00	41	41.4	0.4		1.1
40.00	40	40.5	0.5		1.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Calibration Lab. **เอกสารไม่ควบคุม**

Certificate No : 23-SLM-225
Request No : Req-2023-1413

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
		REF	UUC	ERR	
FAST / A	(dB)	(dB)	(dB)	(± dB)	(± dB)
37-139	43.9	46.0	0.1	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
			Ref	UUC	ERR	
A / 37-139	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	200	135.0	134.9	-0.1	0.2	1
	2	118.0	117.8	-0.2		+1.0, -2.5
	0.25	109.0	108.8	-0.2		+1.5, -5.0
Slow	200	128.6	128.4	-0.2	0.2	1
	2	109.0	108.8	-0.2		+1.0, -5.0
	200	129.0	129.0	0.0		1
SEL	2	109.0	109.0	0.0	0.2	+1.0, -2.5
	0.25	100.0	100.0	0.0		+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance
		REF	UUC	ERR	
FAST / C / 95-142	(dB)	(dB)	(dB)	(± dB)	(± dB)
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
Complete cycle	137.4	136.8	-0.60	0.2	3.0
Positive half cycle	136.4	136.2	-0.20		2.0
Negative half cycle	136.4	136.2	-0.20		2.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-225
Request No : Req-2023-1413

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC	(± dB)	(± dB)
STD Setting	(dB)		
Positive one-half cycle	144.9	0.2	1.5
Negative one-half cycle	144.8		
Deviated	0.1	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC	(± dB)	(± dB)
STD Setting	(dB)		
Initial	138.0	0.1	0.3
Final	138.0		
Deviated	0.0	0.1	0.3

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Name : 81 Soi Udomsak 41, Sukhumvit Road, Bangchak, Prakanong, Bangkok 10260
Address : 10260

Certificate No : 23-SLM-225
Request No : Req-2023-1413

Unit Under Calibration Details

Measurement Item : Sound Level Meter
Manufacturer : LARSON DAVIS
Model : LX72
Serial Number : 0005339
ID : UAE.EFM.036/2563
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : 37B02
Microphone S/N : 11791
Preamplifier Model : PRMLX72B
Preamplifier S/N : 056131
Instrument Status : Used


Calibration Environment and Details


Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 26 June 2023
Calibrated Date : 28 June 2023
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3: 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA000234	29 June 2023	TSI
Audio Generator	Svanick	Svan401	131	12 October 2023	WK Electric

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

Calibrated By : 
Mr. Noppadon Luangrat
Calibration Officer

Approved By : 
Mr. Paet Matlavorn
Calibration Engineer Supervisor
Issue Date : 28 June 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-225
Request No : Req-2023-1413

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		After Adjust		UNCERTAINTY	Acceptance
		UUC	ERR	UUC	ERR		
FAST / A / 37-139	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)
1000 Hz / 114 dB	113.77	114.3	+0.52	113.8	+0.03	0.2	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTER, Model SV 35A, SN. 73246

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting	(dB)	(± dB)
A	28.0	0.1

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

UUC Setting	Measured	UNCERTAINTY
FAST / 37-139	(dB)	(± dB)
UUC Weighting	(dB)	(± dB)
A	27.3	0.1
C	27.2	0.1
Z	31.5	0.1

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
	A	C	Z	(± dB)	(± dB)
FAST / 37-139	(dB)	(dB)	(dB)	(± dB)	(± dB)
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
125 Hz	1.2	1.3	1.3	0.6	2.0
1000 Hz	0.0	0.0	0.0	0.6	1.0
4000 Hz	0.2	0.2	0.2	0.6	3.0
8000 Hz	0.3	0.3	0.4	0.7	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-223
Request No : Req-2023-1411

Certificate No : 23-SLM-223
Request No : Req-2023-1411

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance
FAST / 37-139	Weighting Response curve				Limit
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)
63 Hz	-0.1	0.0	0.0	0.2	2.0
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	-0.1	0.0	0.0		1.5
500 Hz	0.0	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.0	0.1	0.0		2.0
4000 Hz	0.0	0.0	0.0		3.0
8000 Hz	0.0	0.0	0.0		5
16000 Hz	0.0	-0.1	-0.1		+5, -INF.

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
		REF	ERR		
FAST / 37-139					
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	(± dB)
A	114.00	114.0	0.0	0.2	0.2
C	114.00	114.0	0.0		0.2
Z	114.00	114.0	0.0		0.2

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
		REF	ERR		
37-139 / A					
UUC Time Response	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	114.00	114.0	0.0	0.2	0.1
Slow	114.00	114.0	0.0		0.1
Laq	114.00	114.0	0.0		0.1

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		
STD Setting	(dB)	(± dB)	(± dB)
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.3

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance
		REF	ERR		
FAST / A / 37-139					
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)
140.00	140	139.9	-0.1	0.3	0.8
129.00	129	129.0	0.0		1.1
124.00	124	124.0	0.0		1.1
120.00	120	120.0	0.0		1.1
119.00	119	119.0	0.0		1.1
114.00	114	114.0	0.0		1.1
109.00	109	109.0	0.0		1.1
104.00	104	104.0	0.0		1.1
99.00	99	99.0	0.0		1.1
94.00	94	94.0	0.0		1.1
89.00	89	89.0	0.0		1.1
84.00	84	84.0	0.0		1.1
79.00	79	79.0	0.0		1.1
74.00	74	74.0	0.0		1.1
69.00	69	69.0	0.0		1.1
64.00	64	64.0	0.0		1.1
59.00	59	59.0	0.0		1.1
54.00	54	54.0	0.0		1.1
49.00	49	49.0	0.0		1.1
44.00	44	44.1	0.1		1.1
39.00	39	39.3	0.3		1.1
34.00	34	34.4	0.4		1.1
37.00	37	37.5	0.5		1.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

Certificate No : 23-SLM-223
Request No : Req-2023-1411

Certificate No : 23-SLM-223
Request No : Req-2023-1411

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
		REF	ERR		
FAST / A					
UUC Range	(dB)	(dB)	(dB)	(± dB)	(± dB)
37-139	42.5	42.6	0.1	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
			REF	ERR		
A / 37-139						
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	200	135.0	134.9	-0.1	0.2	1
	2	118.0	117.6	-0.4		+1.0, -2.5
	0.25	109.0	108.6	-0.4		+1.5, -5.0
Slow	200	128.6	128.5	-0.1		1
	2	109.0	108.8	-0.2		+1.0, -5.0
	200	129.0	129.0	0.0		1
SEL	2	109.0	109.0	0.0		+1.0, -2.5
	0.25	100.0	99.8	-0.2		+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance
		REF	ERR		
FAST / C / 95-142					
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
Complete cycle	137.4	136.8	-0.60	0.2	3.0
Positive half cycle	136.4	136.2	-0.20		2.0
Negative half cycle	136.4	136.2	-0.20		2.0

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		
STD Setting	(dB)	(± dB)	(± dB)
Positive one-half cycle	141.4		
Negative one-half cycle	141.5		
Deviated	-0.1	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 37-139	UUC		
STD Setting	(dB)	(± dB)	(± dB)
Initial	138.0		
Final	138.0		
Deviated	0.0	0.1	0.3

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

เอกสารไม่ควบคุม

List of Instruments Certification for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Equipment for Air Quality Analysis									
1	Analytical Balance (Readability 0.1 mg)	ฝุ่นละอองขนาดไม่เกิน 10 ไมครอน (PM10)	Mettler-Toledo	MS204TS/00 C252436235	National Food Institute, Ministry of Industry, Thailand	2402420-003-01	19 Apr 24	18 Apr 25	-
Equipment for Water Quality Analysis									
2	pH Meter	pH	Mettler-Toledo	Seven Easy S20 / 1230525212	DKSH (Thailand) Ltd.	C07240167	9 Apr 24	8 Apr 25	-
3	Analytical Balance (Readability 0.01 mg)	SS TDS	Mettler-Toledo	XSR205DU / C210685394	National Food Institute, Ministry of Industry, Thailand	2402283-002-01	2 Apr 24	1 Apr 25	-
4	Hot Air Oven		Memmert	UF55 / B216.1666	National Food Institute, Ministry of Industry, Thailand	2400141-001-01	11 Oct 23	10 Oct 24	-
5	Analytical Balance (Readability 0.1 mg)	Oil&Grease	Mettler-Toledo	AB-204S/FACT / 1129361010	Technology Promotion Association (Thailand-Japan)	24MM292	11 May 24	10 May 25	-
6	Digestor Unit	TKN	FOSS TECATOR	DT2520 / 91794469	FOSS South East Asia	9809	8 Feb 24	7 Feb 25	-
7	Distillation Unit (Kjeldahl Method)		FOSS TECATOR	KT200 / 91790524	FOSS South East Asia	9810	9 Feb 24	7 Feb 25	-
8	BOD Incubator	BOD	Arco	UC4-1320 / (UAE.WAO.015/2561)	Technology Promotion Association (Thailand-Japan)	24TM303	10 Feb 24	9 Feb 25	-
9	DO Meter		YSI	5100 / 11B101863	Technology Promotion Association (Thailand-Japan)	24TW39	21 Feb 24	20 Feb 25	-

List of Instruments Certification for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*	Remark
Equipment for Water Quality Analysis									
10	Incubator	TCB	Memmert	IPP 260 / V616.0066	Technology Promotion Association (Thailand-Japan)	24TM650	2 Apr 24	1 Apr 25	-
11	Water Bath		Memmert	WNE 14 / L416.0606	Technology Promotion Association (Thailand-Japan)	24TM29	10 Feb 24	8 Feb 25	-
12	Auto Clave		ALP	CL-40L / 808763	National Food Institute, Ministry of Industry, Thailand	2402281-001-01	2 Apr 24	1 Apr 25	-
13	Analytical Balance		OHAUS	PX623 / C236754745	DKSH (Thailand) Ltd.	C01234158	7 Dec 23	6 Dec 24	-

Due Date of Calibration* : Based on the annual calibration plan. At least 1 time per year.

Calibration Certificate

Certificate No.: 2402420-003-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakanong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: MS204TS/00

Serial No.: C252436235

ID No.: UAE.AIR.023/2566

Order No.: 2402420

Operation No.: 2402420-003

Date of Receipt: 19 April 2024

Date of Calibration: 19 April 2024

Calibrated by Mr.Pheraphat Tuanjit
Scientist

Approved by *P. Jangphairat*
(Miss Preeyaporn Jaengkarnkit)
Vice President, Department of Laboratory Services
Responsible for the Technical Management Team

Date of Issue: 23 April 2024

The uncertainties are for a confidence probability of approximately 95%
This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme 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. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2402420-003-01
Equipment: Electronic Balance
Model: MS204TS/00
Serial No.: C252436235
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.AIR.023/2566

Page 2 of 3

Date of Calibration: 19 April 2024

Environment Condition: Ambient Temperature: 21.7 ± 1.5 °C Relative Humidity: 65 ± 6.7 %

Place of Calibration: Room 206 Balance Room 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1-500mg	15880	TCS	M23111815	28 November 2024
Standard Weight Class E2	1-500g	15882	TCS	M23111825	28 November 2024

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFLBTH 019/23	Quality Reborn	QR24-0492	4 March 2025

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

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

Calibration Results:

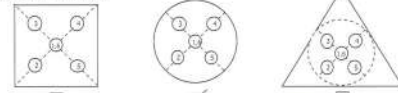
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
100	0.000074
200	0.000074

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0005	100.0006	100.0003	100.0006	100.0003	100.0005	0.0002

F-CS-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2402420-003-01
Equipment: Electronic Balance
Model: MS204TS/00
Serial No.: C252436235
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.AIR.023/2566

Date of Calibration: 19 April 2024

Page 3 of 3

Calibration Results: (Continued)

Calibration Range: 0-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (g)	Coverage Factor k
Unload	0.00000	0.0000	0.0000	0.000094	2.00
0.1	0.10000	0.1000	0.0000	0.000094	2.00
1	0.99998	1.0000	0.0000	0.000097	2.00
5	4.99997	5.0000	0.0000	0.000096	2.00
10	10.00002	10.0000	0.0000	0.00012	2.00
20	20.00003	20.0001	-0.0001	0.00014	2.00
50	49.99998	50.0003	-0.0003	0.00012	2.00
70	70.00000	70.0005	-0.0005	0.00017	2.00
100	99.99997	100.0006	-0.0006	0.00017	2.00
150	149.99994	150.0012	-0.0013	0.00022	2.00
200	200.00001	200.0015	-0.0015	0.00028	2.00

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

----- End -----

F-CS-012 Revision: 01 Date: 20-04-65

Certificate of Calibration

Equipment: pH METER
Model: SevenEasy
Serial No. (or ID.): 1230525212 (UAE.WAS.003/2553)
Manufacturer: METTLER TOLEDO
Electrode Serial No.: 1156883
Condition: In Condition
Certificate No.: C07240167
Issued Date: 9 April 2024
Job No.: WO-0002408
Page: 1 of 3
Model: InLab Solids Brand: METTLER TOLEDO

Customer: United Analyst and Engineering Consultant Company Limited
3 Soi Udomsuk 41 Sukhumvit Road,
Bangchak, Prakanong, Bangkok 10260 Thailand

Environment Condition: Temperature 23 °C ± 2 °C
Humidity 50 %RH ± 15 %RH

Calibration Place: Environment Laboratory, DKSH Technology Limited,
2533 Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260 Thailand

Calibration By: Miss.Orawan Khlaiphloi

Calibration Date: 9 April 2024

The Method used: In house method, CAL-WI-58, base on ASTM E 70-07

Traceability: This certificate is traceable to SI Units, Sample Test is assured through primary measurement method Harned cell, through CPAchem Ltd. (ISO/IEC 17034) Certificate No. 938377, 931985, 931984 And pH Scale traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through Industrial Foundation Electrical and Electronics Institute Certificate No. CA20230350EA

Orawan
(Miss Orawan Khlaiphloi)
Person in charge

Nitinun
(Mr. Nitinun Srhawan)
Authorized signatory

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

Calibration Results:

pH Scale

Input (mV)	pH Meter Reading			Uncertainty of Measurement (mV)	Coverage Factor (k)
	(mV)	Error (mV)	(pH)		
414.12	414	-0.12	0.00	0.58	2.00
354.96	355	0.04	1.00	0.58	2.00
295.8	296	0.20	2.00	0.58	2.00
236.64	237	0.36	3.00	0.58	2.00
177.48	178	0.52	4.00	0.58	2.00
118.32	118	-0.32	5.00	0.58	2.00
59.16	59	-0.16	6.00	0.58	2.00
0	0	0.00	7.00	0.58	2.00
-59.16	-59	0.16	8.00	0.58	2.00
-118.32	-118	0.32	9.00	0.58	2.00
-177.48	-177	0.48	10.00	0.58	2.00
-236.64	-236	0.64	11.00	0.58	2.00
-295.8	-296	-0.20	12.00	0.58	2.00
-354.96	-355	-0.04	13.00	0.58	2.00
-414.12	-414	0.12	14.00	0.58	2.00

Practical slope and zero point*

The three-point calibration using three standard buffer solutions; pH 4.008 , pH 6.985 and pH 9.997

-During calibration, display of pH meter reading; pH 4.00 , pH 7.00 and pH 10.01

The practical slope of the pH electrode; 57.01 (mV/pH), 96.37%

The zero point of the pH electrode; 6.88 (pH)

Sample Test Results

Standard Buffer Solution (pH)	Unit Under Calibration (pH)	Difference (pH)	Uncertainty of Measurement (pH)	Coverage Factor (k)
4.008	3.99	-0.018	0.0070	2.00
6.985	7.00	0.015	0.0091	2.00
9.997	10.02	0.023	0.0074	2.00

* Calibration Marked * Not TISI Accredited * in this Certificate have been included for completeness.

The End of Certificate



Certificate of Calibration

Equipment:	Digital Thermometer with Probe	Certificate No.: C15240373
Model:	SevenEasy pH	Issued Date: 09 April 2024
Serial No.:	1230525212	Job No.: WO-00024208
Manufacturer:	METTLER TOLEDO	Page: 1 of 2
ID No.:	UAE.WAS.003/2553	Condition: In Condition

Customer: United Analyst and Engineering Consultant Company Limited
3 Soi Udumsuk 41 Sukhumvit Road,
Bangkok, Prakanong, Bangkok 10260 Thailand

Environment Condition: Temperature: 22 °C ± 3 °C
Humidity: 50 %RH ± 20 %RH
Voltage: 220 VAC ± 10 %

Calibration Place: Thermo-Hygro Laboratory, DKSH Technology Limited,
2533 Sukhumvit Road, Bangkok,
Phrakhanong, Bangkok 10260 Thailand

Calibration By: Mr. Nateekarn Mitjit
Calibration Date: 09 April 2024
The Method used: In house method, CAL-WI-19, by comparison with standard thermometer
Traceability: This certificate is traceable to the International System of Unit maintained by
Quality Reborn Co.,Ltd. (QR) Certificate No. QR23-1073

(Mr. Nateekarn Mitjit)

Person in charge

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

(Mr. Pramote Ramrong)

Authorized signatory

Reference standard equipment:

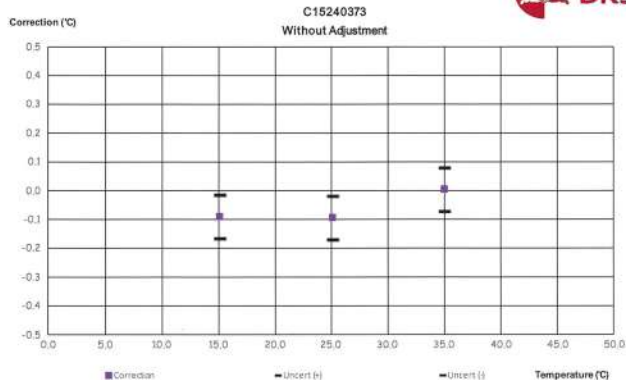
Equipment	Certificate no	Cal. date	Next Cal. date
Digital Thermometer with Probe	QR23-1073	2 May 23	2 May 24

Calibration Results:

Without Adjustment

Sensor Type: RTD	Channel: -			
Diameter (mm) 4	Length (mm): 135	Immersion (mm): 110		
Calibrate Point (°C)	STD. Reading (°C)	UUC. Reading (°C)	Correction of UUC (°C)	Uncertainty (± °C)
15.0	15.010	15.1	-0.090	0.076
25.0	25.006	25.1	-0.094	0.076
35.0	35.004	35.0	0.004	0.076

The End of Certificate



Delivering Growth – in Asia and Beyond.

เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2402283-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 SOI UDOMSUK 41, SUKHUMVIT ROAD,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 4

Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Order No.: 2402283
Operation No.: 2402283-002
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong Scientist
Approved by (Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 9 April 2024

The uncertainties are for a confidence probability of approximately 95%

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation Scheme 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. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024 Page 2 of 4

Environment Condition: Ambient Temperature: 24.5 ± 0.5 °C Relative Humidity: 47.5 ± 2.5 %

Place of Calibration: Laboratory, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-MA-001 In-House Method based on UKAS Lab 14 : 2019

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Standard Weight Class E2	1mg to 200g	8505567572	TCS	M23040535	8 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFLBTH 016/23	Quality Reborn	QB24-0343	9 February 2025

3. This certification is traceable to SI UNIT

4. This certificate was certified only for the instrument we calibrated.

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

Calibration Results:

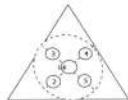
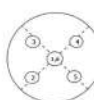
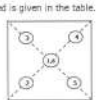
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
40	0.000042
80	0.000052
100	0.000048
200	0.000048

2. Off-Center Error:

A mass of 100 g was placed and moved to various position on pan.

The balance reading obtained is given in the table.



1	2	3	4	5	6	(Maximum Difference)
(g)	(g)	(g)	(g)	(g)	(g)	(g)
100.0000	100.0001	99.9999	99.9999	100.0001	100.0000	0.0001

F-CS-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 2 April 2024 Page 3 of 4

Calibration Results: (Continued)

Calibration Range: 0 - 80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 80 g ; Resolution: 0.00001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor
Unloaded	0.000000	0.000000	0.000000	0.0000086	2.00
0.001	0.001003	0.001011	-0.000011	0.0000089	2.00
0.005	0.005003	0.005000	0.000003	0.0000092	2.00
0.01	0.010003	0.010000	0.000003	0.0000089	2.00
0.05	0.049996	0.050000	0.000004	0.0000096	2.00
0.1	0.100011	0.100000	0.000011	0.000011	2.00
0.5	0.500016	0.500001	0.000015	0.000014	2.00
1	1.000003	1.000002	-0.000001	0.000016	2.00
2	2.000023	2.000001	0.000022	0.000017	2.00
5	5.000017	5.000002	0.000015	0.000020	2.00
10	10.000009	10.000000	0.000009	0.000026	2.00
20	20.000031	20.000003	0.000028	0.000037	2.00
30	30.000040	30.000001	0.000039	0.000050	2.00
50	50.000028	50.000002	0.000026	0.000068	2.00
80	80.000058	80.000002	0.000056	0.000111	2.00

F-CS-012 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C210685394
ID No.: UAE.WAO.010/2565
Capacity: 220 g

Date of Calibration: 2 April 2024 Page 4 of 4

Calibration Results: (Continued)

Calibration Range: 81 - 200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 81 - 200 g ; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (± g)	Coverage Factor k
90	90.00010	90.0001	0.0000	0.00015	2.00
100	100.00006	100.0001	0.0000	0.00015	2.00
110	110.00007	110.0001	0.0000	0.00016	2.00
120	120.00009	120.0000	0.0001	0.00017	2.00
130	130.00010	130.0000	0.0001	0.00019	2.00
140	140.00014	140.0000	0.0001	0.00020	2.00
150	150.00009	150.0001	0.0000	0.00020	2.00
160	160.00010	160.0001	0.0000	0.00022	2.00
170	170.00012	170.0001	0.0000	0.00023	2.00
200	200.00016	200.0002	0.0000	0.00028	2.00

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

***** End *****

F-CS-012 Revision: 01 Date: 20-04-65

2008 ๒๕๕๑ ถนนสุขุมวิท 35 แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร 10110
2008 Soi 35, Asoi Asoi Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10110 Thailand
Tel : +66(0) 2422 8688 Fax : +66(0) 2422 8545



Calibration Report

Certificate No.: 2400141-001-01
Equipment: CHAMBER (Hot Air Oven)
Manufacturer: MEMMERT
Model: UF 55
Serial No.: B216.1666
Resolution: 0.1 °C
ID No.: UAE.WAO.027/2559
Manufacturer: MEMMERT

Date of Calibration: 11 October 2023 Page 2 of 3

Location: Laboratory, Floor 2, UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.

Environment Condition:
Ambient Temperature (28 ± 1) °C
Relative Humidity (63 ± 2) %
Line Voltage (228 ± 1) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert 9 standard thermometer into its chamber and calibration according to W-TE-014 Based on TLAS G-20-1/02-08 (E): Guidelines for Calibration and Checks of Temperature Controlled Enclosures.
- The temperature scale used was based on ITS - 90.
- All data show below were final values and the initial data may be obtained upon request.

2. Reference Standard Instrument :

Instrument	Model	Serial No./ID No.	Certificate No.	Due Date	Through
Digital Thermometer with sensor	34972A	MY49016894	TE 660380-01	22 April 2024	NATIONAL FOOD INSTITUTE
	RTD	CH#203-209/ RTD#203-209			

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibrated item : Good

UUC Description :
Time of Record 1 Hour 9 Minute At 104.0, 140.0 and 180.0 °C
Fresh air Damper - Open Position -
X Close
- Not Available
7. Result of Calibration : X Without adjustment After adjustment

F-CS-012 Revision: 01 Date: 20-04-65

2008 ๒๕๕๑ ถนนสุขุมวิท 35 แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร 10110
2008 Soi 35, Asoi Asoi Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10110 Thailand
Tel : +66(0) 2422 8688 Fax : +66(0) 2422 8545



Calibration Certificate

Certificate No.: 2400141-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 3

Equipment: CHAMBER (Hot Air Oven)

Manufacturer: MEMMERT

Model: UF 55

Serial No.: B216.1666

ID No.: UAE.WAO.027/2559

Order No.: 2400141

Operation No.: 2400141-001

Date of Receipt: 11 October 2023

Date of Calibration: 11 October 2023

Calibrated by Mr.Worapob Sooktong
Scientist

Approved by (Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team

Date of Issue: 16 October 2023

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme 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. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65

2008 ๒๕๕๑ ถนนสุขุมวิท 35 แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร 10110
2008 Soi 35, Asoi Asoi Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10110 Thailand
Tel : +66(0) 2422 8688 Fax : +66(0) 2422 8545

Calibration Report

Certificate No.: 2400141-001-01
Equipment: CHAMBER (Hot Air Oven)
Manufacturer: MEMMERT
Model: UF 55
Serial No.: B216.1666
Resolution: 0.1 °C
ID No.: UAE.WAO.027/2559
Manufacturer: MEMMERT

Date of Calibration: 11 October 2023 Page 3 of 3

Calibration point: 104.0, 140.0 and 180.0 °C

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
MIN	28.2	61.4	227.4
MAX	28.3	65.1	229.3

Table 1 : Reporting of Temperature

Calibration point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.9 is REF)									Uncertainty ± (°C)
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	
104.0	104.05	103.98	104.02	104.08	104.00	104.05	103.99	104.17	104.00	0.53
140.0	140.09	139.99	139.91	140.05	139.99	139.91	139.97	140.26	139.97	0.73
180.0	180.46	180.33	180.25	180.28	180.33	179.96	180.31	180.64	180.16	0.90

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* reading (°C)			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	MIN	MAX	Average			
104.0	104.0	104.0	104.0	0.090	0.18	0.38
140.0	140.0	140.1	140.0	0.075	0.28	0.47
180.0	180.0	180.1	180.0	0.13	0.48	0.88

Note: The quoted uncertainty include " Stability " and " Loading effect (20% of Temp Uniformity) "

UUC* = Unit Under Calibration

Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.

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.

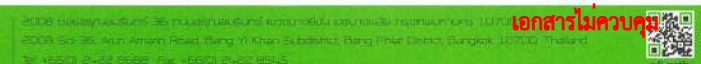
Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.

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

***** End *****

F-CS-012 Revision: 01 Date: 20-04-65

2008 ๒๕๕๑ ถนนสุขุมวิท 35 แขวงคลองตัน เขตคลองเตย กรุงเทพมหานคร 10110
2008 Soi 35, Asoi Asoi Road, Bang Yi Khan Subdistrict, Bang Phai District, Bangkok 10110 Thailand
Tel : +66(0) 2422 8688 Fax : +66(0) 2422 8545





Certificate of Calibration

Cert.No.: 24MM292
Page: 1 of 3

Equipment : Electronic Balance
Manufacturer : Mettler Toledo
Model : AB204-S1FACT
Serial No. : 1129361010
ID No. : UAE.WAS.002/2552
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Sol Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Balance Room (108)
Received order : 11 May 2024
Calibration Date : 11 May 2024
Ambient Temperature : 15 °C to 40 °C
Relative Humidity : 30 % to 90 %
Calibrated by : Khit Ruttanaprapachai
Approved by :
() Ponpan Paipim
() Suwit Imjai
(✓) Kunchit Promprat

Issue Date : 15 May 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Procedure used :

Cert.No.: 24MM292
Page: 2 of 3

Calibration were conducted using in-house calibration procedure CP-OB01 based on UKAS LAB 14 according to direct measurement method against standard weight.

Condition of this result of calibration

1. Reference standard instruments:-

Instruments	Model	Serial No.	ID No.	Test report No.	Due date
1) Standard Weight Set (E2)	15884	24053	70RC007	MM-0013-24	25 Jan 2026

- This certificate is valid only to the item calibrated on date and place of calibration.
- This result of calibration was made on requested at the point specified by customer.
- This certificate is not certified for any commercial transaction.
- This certification is traceable to the International System of Unit.

Result of calibration () Without Adjustment (*) After Adjustment by Internal Calibration

Range capacity : 0 g to 220 g Resolution 0.0001 g

Before Adjustment :

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
100	100.0000	0.0000	0.19	2.03
200	200.0006	-0.0006	0.30	2

After Adjustment :

1. Determination of the standard deviation of weighing machine (n = 10)

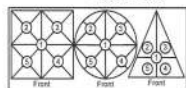
Applied Weight (g)	Standard Deviation of Reading (g)
100	0.00007
200	0.00005

เอกสารไม่ควบคุม



Equipment : Electronic Balance
Condition As-Received : Used Item
Reference : 2405-0166OC-1
Result of calibration

Cert.No.: 24MM292
Page: 3 of 3



Maximum difference between off-center and central loading

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	(g)
-0.0004	-0.0004	-0.0003	-0.0003	-0.0004	0.0001

3. Departure from nominal value

Applied Weight (g)	Balance Reading (g)	Correction (g)	Measurement Uncertainty (± mg)	Coverage Factor (k)
Unload	0.0000	0.0000	0.15	2.13
0.01	0.0100	0.0000	0.15	2.13
0.05	0.0500	0.0000	0.15	2.13
0.1	0.1000	0.0000	0.15	2.13
0.5	0.5000	0.0000	0.15	2.13
1	1.0000	0.0000	0.15	2.13
10	10.0000	0.0000	0.15	2.11
50	49.9999	+0.0001	0.17	2.06
100	99.9999	+0.0001	0.19	2.03
150	149.9998	+0.0002	0.29	2
200	199.9990	+0.0010	0.30	2

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

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เอกสารไม่ควบคุม

FOSS

Customer Service Report

Date: 8 Feb 2024
Customer: UAE
Instrument: DT2520

FOSS South East Asia
3388 Sirinrat Building, 25th - 26th Floor, Unit No. 3388/90,
Rama IV Road, Klongton, Klongtoey, Bangkok, Thailand 10110

Report No: 9809

Address: BAN WONG

Serial: 91774469

Hours Start: 08:00
Finish: 09:10

Labour: 14:00
16:00 2 hrs

Travel From Customer: 16:00
18:00 2 hrs

Application	Special	Standard
Normal	Courtesy Visit	Installation
Distributor	PMA Onboarding	Quote
Internal	Warranty	Repair
Digital Service	Sales Support	Remote
		Other

PO/Quote Number: If applicable

PMA Type: FOSS/ANAL If applicable Contract No. If applicable

Details of Work / Test	Condition / Status
# PM DT2520	
- ตรวจสอบสายเคเบิล	
- ตรวจสอบ connection	
- ตรวจสอบอุณหภูมิ (cable kit, temp cut off)	
- ตรวจสอบการตั้งค่า	
- 30°C - 100°C = 10 min	
- 30°C - 420°C = 37 min	
- Instrument 419.0 Factor = 419.0	
Instrument Ready for Use	OK Not OK If not OK - Comment

Part No.	Batch	Description	Qty
60079452	23.09.2023	Cable kit digester	1
10011654	03.01.2024	Temperature cut-off	1

I confirm this report is accurate and complete
Signed FOSS:
Name:
Signed Customer:
Name:
Would you be willing to participate in a brief survey in order to tell us how we performed? Email:

เอกสารไม่ควบคุม

Date: 9 Feb 2024

Customer: UAE

Address: Bangkok

Instrument: KT200

Serial: 91790524

Hours	Travel To Customer	Labour	Travel From Customer
Start	08:00	09:30	14:50
Finish	09:30	12:00	16:30

Application	Special	Job Type	Standard
Normal	Courtesy Visit	Installation	Training
Distributor	PMA Onboarding	Quote	In House
Internal	Warranty	Repair	PM
Digital Service	Sales Support	Remote	Other

PO/Quote Number: - If applicable

PMA Type: FOSS/ATE If applicable Contract No. If applicable

Details of Work / Test	Condition / Status
# PM KT200	
- ตรวจสอบเครื่อง PM	
- ตรวจสอบ 3 pin 100 mV	
- Balance 30 mV - 30 mV	
- ตรวจสอบ PM kit	
- ตรวจสอบ 100 mV	
# PM KT200	
- ตรวจสอบ 3 pin 100 mV	
- Balance 30 mV - 30 mV	
- ตรวจสอบ PM kit	
- ตรวจสอบ 100 mV	

Instrument Ready for Use (OK) Not OK If not OK - Comment

Part No.	Batch	Description	Qty
10000965	14-12-2020	Foss PM kit 1000 1000 1000 1000	1

I confirm this report is accurate and complete

Signed FOSS: [Signature] Signed Customer: [Signature]

Name: [Name] Name: [Name]

Would you be willing to participate in a brief survey in order to tell us how we performed? Email

เอกสารไม่ควบคุม



Certificate of Calibration

Equipment : BOD Incubator
Manufacturer : Arco
Model : UC4-1320
Serial No. : 13URC4S013201
ID No. : UAE.WAO.015/2561
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 10 February 2024
Calibration Date : 10 February 2024
Ambient Temperature : (28 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Tawatchai Pama
Approved by : [Signature]
() Pornthippa Tameyakul
(x) Unnophol Harachai
() Suwit Imjai

Issue Date : 19 February 2024

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3: Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2402-0234OC-1
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Not Available

Cert. No.: 24TM303
Page: 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
20.0	20.1	19.9	0.37	0.72	1.4	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
20.0	19.873	19.803	20.322	19.690	19.615	19.585	19.612	19.558	19.645	0.58

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

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.

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

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

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

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เอกสารไม่ควบคุม



Equipment : BOD Incubator
Condition As-Received : Used Item
Reference : 2402-0234OC-1
Procedure Used :-

Cert. No.: 24TM303
Page: 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD). The temperature scale used was based on ITS-90.

Condition of this result of calibration

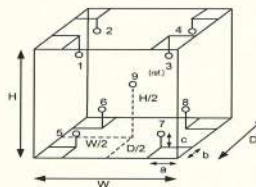
- Reference standard instrument:-
- Instrument Serial No. Cert. No. Traceable Due Date
- 1) Data Acquisition MY59003411 23LM208 TPA 27 Dec 2024
- This certificate is valid only to the item calibrated on date and place of calibration.
- This certificate is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Not Available



Probe Installation Details : Dimension of Chamber :
a = 10 cm D = 0.62 m
b = 10 cm W = 1.2 m
c = 10 cm H = 1.2 m
Capacity = 0.89 m³

Environment during calibration	Beginning		Finished	
	Temp. (°C)	REL Humid. (%)	Temp. (°C)	REL Humid. (%)
Temp. (°C)	28	31		
REL Humid. (%)	70	65		
AC Supply (Volt)	233	234		

Position	Ref. Std. ID No.
1	20RTD-2/1
2	20RTD-2/2
3	20RTD-2/3
4	20RTD-2/4
5	20RTD-2/5
6	20RTD-2/6
7	20RTD-2/7
8	20RTD-2/8
9 (ref.)	20RTD-2/9

เอกสารไม่ควบคุม



Cert.No.: 24TW39
Page.: 1 of 2

Certificate of Testing

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2554
Received Date : 20 February 2024
Test Date : 21 February 2024
Reference : 2402-0629DSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260
Laboratory Condition : Temperature (25 ± 5) °C
Humidity (50 ± 20) %
Test Procedure : In - house method : CP-CH9
by Comparison Technique with Azide Modification Method
Tested by : Walalak Sirinthean

Approved by :

Approved Signatory

() Pornthippa Tameyakul
() Unnopphol Harachai
(✓) Saithip Meangmai

Issue Date : 22 February 2024

เอกสารไม่ควบคุม



Cert.No.: 24TW39
Page.: 2 of 2

Condition of this result of calibration

1. Reference Standard Instruments :
This certification is traceable to the International System of Unit through the reference standards laboratory of Industrial Calibration Center, Technology Promotion Association (Thailand-Japan).

Instruments	Serial No.	ID No.	Certificate No.	Due Date
1. Burette	-	130BU10	23CG1172	22 Mar 2025
2. Balance	14233821	110RC001	23MM405	16 July 2024

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate pentahydrate	Merck	AM1763316	100.2%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 22B100125

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.20	8.19	0.0055

This report was certified only for the instrument we tested. It is allowable to use for study
Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced
other in full, without written approval of the laboratory

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เอกสารไม่ควบคุม



Cert. No.: 24TM850
Page : 1 of 3

Certificate of Calibration

Equipment : Incubator
Manufacturer : Memmert
Model : IPP 260
Serial No. : V616.0066
ID No. : UAE.MIC.032/2559
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory (302)
Received Order : 01 April 2024
Calibration Date : 02 - 03 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Man Pattanapongpaiboon

Approved by :

Approved Signatory

() Ponpan Paipim
(✓) Suwit Imjai
() Kunchit Promprat

Issue Date : 7 April 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-2
Procedure Used :-

Cert. No.: 24TM850
Page : 2 of 3

Calibration were conducted using calibration procedure CP-OT02 based on TLAS G-20 according to direct measurement method with Data Acquisition which connected with Resistance Temperature Detector (RTD).
The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument-
Instrument Serial No. Cert. No. Traceable Due Date
1) Data Acquisition MY49023932 23LM122 TPA 26 Jul 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.

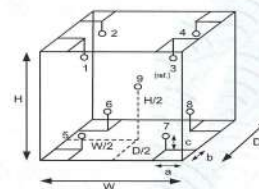
3. This certification is traceable to the International System of Unit.

Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details :

a = 5.0 cm
b = 5.0 cm
c = 5.0 cm

Dimension of Chamber :

D = 0.50 m
W = 0.64 m
H = 0.80 m
Capacity = 0.26 m³

Environment during calibration		
	Beginning	Finished
Temp. (°C)	25	25
REL.Humid. (%)	57	54
AC Supply (Volt)	221	222

Position :	Ref. Std. ID No.:
1	19-16RTD-01
2	19-16RTD-02
3	19-16RTD-03
4	19-16RTD-04
5	19-16RTD-05
6	19-16RTD-06
7	21-16RTD-07
8	19-16RTD-08
9 (ref.)	19-16RTD-09

เอกสารไม่ควบคุม



Equipment : Incubator
Condition As-Received : Used Item
Reference : 2404-0003OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM650
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor k
25.0	25.0	25.0	0.053	0.78	1.3	2
36.0	36.0	36.0	0.14	0.57	0.93	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
25.0	25.596	25.310	25.439	25.412	24.347	24.332	24.313	24.414	24.875	0.30
36.0	35.843	35.965	35.618	35.701	36.239	36.260	36.343	36.357	36.063	0.31

Average* : The average of 30 values in each position.

Temperature stability : One-half of the greatest maximum difference of measured temperature at any one sensor.

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.

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

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity .

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

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เอกสารไม่ควบคุม



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert. No.: 24TM29
Page : 1 of 3

Certificate of Calibration

Equipment : Water Bath
Manufacturer : Memmert
Model : WNE 14
Serial No. : L416.0608
ID No. : UAE.MIC.002/2580
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomasuk 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Microbiology Laboratory
Received Order : 10 February 2024
Calibration Date : 10 February 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %

Calibrated by : Krisda Malee

Approved by :
Approved Signatory

() Pornthippa Tameyakul
(✓) Unnopphol Harachal
() Suwit Imjai

Issue Date : 19 February 2024

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2402-0232OC-2
Procedure Used :-

Cert. No.: 24TM29
Page : 2 of 3

Calibration were conducted using in-house calibration procedure CP-OT04 Based on ASTM E715 according to direct measurement method with Data Acquisition which connected with Industrial Platinum Resistance Thermometer (IPRT).

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Serial No.	Cert. No.	Traceable	Due Date
1) Data Acquisition	MY49001451	23LM27	TPA	25 Feb 2024

2. This certificate is valid only to the item calibrated on date and place of calibration.
3. This certification is traceable to the International System of Unit.

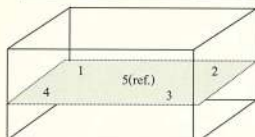
Remark : TPA : Technology Promotion Association (Thailand - Japan)

Result of Calibration :- (*) Without Adjustment

Function of UUC* : Temperature Source

Heat transfer medium used : Water

	Environmental		AC Voltage Supply
	(°C)	(%R.H.)	
Beginning of Calibration	26	51	220
Finished of Calibration	25	50	221



Front

Position :	Ref. Std. ID No.:
1	N37P301419
2	N37P300732
3	N37P301420
4	N37P301421
S(ref.)	N37P301425

เอกสารไม่ควบคุม



Equipment : Water Bath
Condition As-Received : Used Item
Reference : 2402-0232OC-2
Result of Calibration :- (*) Without Adjustment
Function of UUC* : Temperature Source

Cert. No.: 24TM29
Page : 3 of 3

Calibration point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Average* Standard Reading (°C)					Uncertainty (± °C)
			1	2	3	4	5 (ref.)	
44.5	44.4	44.4	44.508	44.469	44.502	44.521	44.527	0.15

Calibration point (°C)	Uniformity (°C)	Stability (± °C)	Coverage Factor k
44.5	0.15	0.074	2

Average* : The average of 30 values in each position.

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.

Stability : One-half of the greatest maximum difference of measured temperature at any one probe.

UUC* : Unit Under Calibration

Note : The reported uncertainty of measurement was included stability and excluded uniformity.

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

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เอกสารไม่ควบคุม

Calibration Certificate

Certificate No.: 2402281-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 3

Equipment: Autoclave
Manufacturer: ALP
Model: CL-40L
Serial No.: 808763
ID No.: UAE.MIC.026/2563
Order No.: 2402281
Operation No.: 2402281-001
Date of Receipt: 2 April 2024
Date of Calibration: 2 April 2024

Calibrated by Mr.Jerawut Prapawuttipong
Scientist
Approved by (Mr.Pheraphat Tuanjit)
Manager, Division of Calibration Laboratory
Responsible for the Technical Management Team
Date of Issue: 9 April 2024

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme 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. This certificate may not be reproduced other than in full except with the prior written approval of the National Food Institute.

F-CS-009 Revision: 01 Date: 20-04-65

Calibration Report

Certificate No.: 2402281-001-01
Equipment: Autoclave
Model: CL-40L Serial No.: 808763
Resolution: 0.1 °C ID No.: UAE.MIC.026/2563
Manufacturer: ALP
Date of Calibration: 2 April 2024

Page 2 of 3

Location: LABORATORY, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Environment Condition: Ambient Temperature (25 ± 1) °C
Relative Humidity (55 ± 7) %
Line Voltage (225 ± 5) Volt

Condition of this results of Calibration:

- This instrument was calibrated by insert 3 standard temperature recorder with RTD into its autoclave and calibration according to W-TE-018 based on BS 2646-1(2021) : Autoclaves for sterilization in laboratories Design, construction, safety and performance Specification.
- The temperature scale used was based on ITS - 90 .
- All data show below were final values and the initial data may be obtained upon request.
- Reference Standard Instrument :

Instrument	Model	Serial No.	Certificate No.	Due Date	Through
Digital Thermometer with RTD (Data Logger)	HiTemp140-2	R54918	TE 660383-01	8 April 2024	NATIONAL FOOD INSTITUTE
	HiTemp140-2	S25601	TE 670033-01	9 November 2024	MADGETECH INC.
	HiTemp140-2	S25602	TE 670034-01	9 November 2024	MADGETECH INC.

- This certificate is traceable to International System of Units (SI Units).
- This certificate was certified only for the instrument we calibrated.
- This result of calibration was found accurate as shown on date and place of calibration only.
- This standard does not apply to sterilizers or disinfectors used for medical, dental, pharmaceutical.
- Condition of Calibrated item : Good
UUC Description : Setting program function sterilization : STERILIZE/NORMAL
Time of sterilization 15 Minute At 115.0 and 121.0 °C
- Result of Calibration : ☒ Without adjustment
☐ After adjustment

F-CS-012 Revision: 01 Date: 20-04-65

Calibration Report

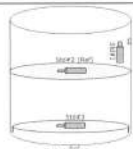
Certificate No.: 2402281-001-01
Equipment: Autoclave
Model: CL-40L Serial No.: 808763
Resolution: 0.1 °C ID No.: UAE.MIC.026/2563
Manufacturer: ALP
Date of Calibration: 2 April 2024

Page 3 of 3

Calibration point: 115.0 and 121.0 °C

Calibration result:

Calibration Condition	Temperature (°C)	Relative Humidity (%)	Line Voltage (Volt)
Min	24.4	48.6	220
Max	25.5	62.1	230



Standard ALP autoclave
S25601 = Attached to the test temperature probe, within 25 mm.
S25602 = In the upper half of the chamber
S25603 = In the chamber door, within 150 mm

Table1 : Reporting of Temperature

Calibration Point (°C)	Measured Temperature (°C) @ Sensor No. (Sensor No.2 is REF)			Uncertainty ± (°C)
	Std.# 1	Std.# 2 (Ref)	Std.# 3	
115.0	115.28	115.35	115.38	0.64
121.0	121.28	121.36	121.37	0.64

Table 2 : Reporting of Characterization Result

UUC* Setting (°C)	UUC* Reading			Stability ± (°C)	Uniformity (°C)	Overall Variation (°C)
	Min (°C)	Max (°C)	Average (°C)			
115.0	115.0	115.1	115.0	0.08	0.13	0.48
121.0	121.0	121.1	121.0	0.12	0.10	0.38

Note

The quoted uncertainty include " Stability " and " Loading effect (20% of Uniformity)"
UUC* = Unit Under Calibration
Stability = One-half of the greatest maximum difference of measured temperatures at any one sensors, for at least half an hour after reaching steady state.
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.
Overall Variation = The difference of the maximum and minimum measured temperatures throughout observation time.
The report uncertainty of measurement was based on standard uncertainty multiplied by coverage factor k = 2, providing a level of confidence of approximately 95 %.

***** End *****

F-CS-012 Revision: 01 Date: 20-04-65

Certificate of Calibration

Equipment: Balance
Model: PX623
Serial No. (or ID.): C236754745 (UAE.MIC.055/2565)
Manufacturer: Ohaus
Condition: In condition
Certificate No.: C01234158
Issued Date: 08 December 2023
Job No.: WO-00011251
Page: 1 of 3

Customer: United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak Sub-District,
Phrakhanong District, Bangkok, THAILAND 10260

Environment Condition: Temperature 25 °C ± 0.5 °C
Humidity 54 %RH ± 1.7 %RH

Calibration Place: United Analyst and Engineering Consultant Co., Ltd. (301 Microbiology Room)
3 Soi Udomsuk 41, Sukhumvit Road, Bangchak Sub-District,
Phrakhanong District, Bangkok, THAILAND 10260

Calibration By: Mr. Adisai Maknoi
Calibration Date: 07 December 2023
The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02222534

(Mr. Adisai Maknoi)
Person in charge

(Mr. Rungrod Jenkitrakulchal)
Authorized signatory

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

ชื้อ: DKSH Technology Limited
2533 Sukhumvit Road, Bangkok, Prakhonong, Bangkok 10260
Phone: +66 2639 7000 Email: info@calibration@dksh.com Website: www.dksh.com/certification-thailand

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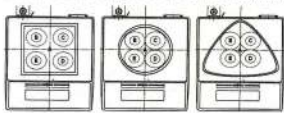
เอกสารไม่ควบคุม

CAL-FM-C01-14: 12 Sep 2022

Calibration Results:

Before Adjustment

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



Nominal Test Value		200			(g)
Reference Points (g)					
A	B	C	D	E	
-	0.000	-0.003	0.000	0.001	

Repeatability: Determination of the standard deviation of weighing balance., Readability

0.001 (g)

Nominal test value (g)	Standard Deviation
50	0.0006
500	0.0008

Error of Indication from nominal or conventional mass value., Readability

0.001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
1	1.0000	1.000	0.000	0.0013	2.10
5	5.0001	5.000	0.000	0.0013	2.10
10	10.0001	10.001	0.001	0.0013	2.10
20	20.0000	20.000	0.000	0.0013	2.09
50	50.0001	50.000	0.000	0.0013	2.09
100	100.0001	100.001	0.001	0.0013	2.09
200	200.0004	200.002	0.002	0.0014	2.07
300	300.0005	300.002	0.002	0.0015	2.05
400	400.0006	400.004	0.003	0.0016	2.03
500	500.0006	500.008	0.007	0.0019	2.02
600	600.0007	600.009	0.006	0.0021	2.01

บริษัท ดีเคเอสเอ เอเชีย (ไทยแลนด์) จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
Phone: +66 2638 7100 Email: info.asia@dksh.com Website: www.dksh.com/scientific-thailand

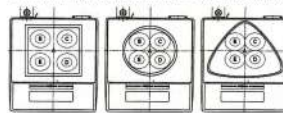
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CAL-FM-C01-14; 12 Sep 2022

After Adjustment

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



Nominal Test Value		200 (g)		
Reference Points (g)				
A	B	C	D	E
-	0.001	-0.002	-0.002	0.001

Repeatability: Determination of the standard deviation of weighing balance., Readability

0.001 (g)

Nominal test value (g)	Standard Deviation
50	0.0006
500	0.0008

Error of Indication from nominal or conventional mass value., Readability

0.001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of Indication (g)	Uncertainty (g)	k
1	1.0000	1.000	0.000	0.0013	2.10
5	5.0001	5.000	0.000	0.0013	2.10
10	10.0001	10.000	0.000	0.0013	2.10
20	20.0000	20.000	0.000	0.0013	2.10
50	50.0001	50.000	0.000	0.0013	2.10
100	100.0001	100.000	0.000	0.0014	2.09
200	200.0004	200.000	0.000	0.0014	2.07
300	300.0005	300.001	0.001	0.0015	2.05
400	400.0006	400.002	0.001	0.0017	2.04
500	500.0006	500.001	0.000	0.0019	2.02
600	600.0007	600.002	0.001	0.0021	2.01

The End of Certificate

บริษัท ดีเคเอสเอ เอเชีย (ไทยแลนด์) จำกัด
DKSH Technology Limited
2533 ถนนสุขุมวิท แขวงคลองเตย เขตคลองเตย กรุงเทพมหานคร 10260
Phone: +66 2638 7100 Email: info.asia@dksh.com Website: www.dksh.com/scientific-thailand

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เอกสารไม่ควบคุม

CAL-FM-C01-14; 12 Sep 2022

Statements of conformity:

This conformity certificate documents the validity of the following statements of conformity based on the measurement results of corresponding calibration certificate:

The error of indication determined during calibration are under given measurement and environmental conditions and considering the expanded measurement uncertainty (coverage probability 95%) within the specification. The given measurement uncertainty already includes other all effects by according to the standard method, UKAS Lab14. Therefore, those parameters have not been assessed separately.

Tolerance and Decision rules:

Assessment of the conformity of the measurement device are done based on direct comparison of the relevant measurement results with the tolerances and decision rule are prescribed by the customer.

- Decision rule :** ☐ Choice A Binary Statement for Simple Acceptance Rule ($w = 0$), Specific Risk < 50% PFA.
☒ Choice B Non-binary statement with guard band ($w = 1$ U), Pass or Fail Specific Risk < 2.5% PFA and Condition Pass or Condition Fail Specific Risk < 50% PFA.
☐ Choice C Customer defined, Customers may define arbitrary multiple of r to have applied as guard band ($w = r$ U).
; PFA - Probability of False Accept

Rungrod

(Mr. Rungrod Jenkitrakulchai)

Authorized signatory

Statements of conformity:

Before Adjustment

Readability: 0.001 g

Nominal Value (g)	Error of indication (g)	Guard band (w) (g)	Tolerance (Δ) (g)	Conformity
1	0.000	0.0013	0.002	Pass
5	0.000	0.0013	0.010	Pass
10	0.001	0.0013	0.020	Pass
20	0.000	0.0013	0.040	Pass
50	0.000	0.0013	0.100	Pass
100	0.001	0.0013	0.200	Pass
200	0.002	0.0014	0.400	Pass
300	0.002	0.0015	0.600	Pass
400	0.003	0.0016	0.800	Pass
500	0.007	0.0019	1.000	Pass
600	0.008	0.0021	1.200	Pass

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

Statements of conformity:

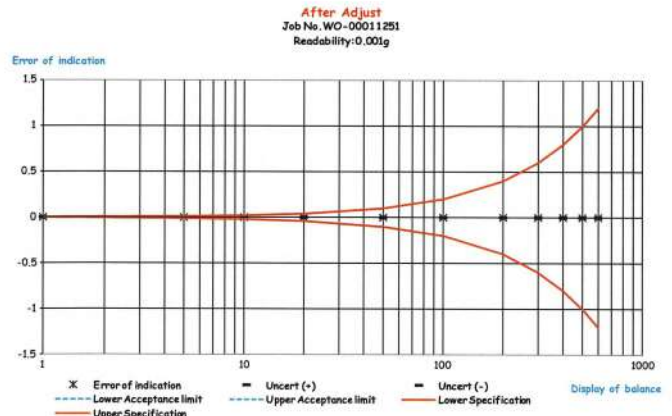
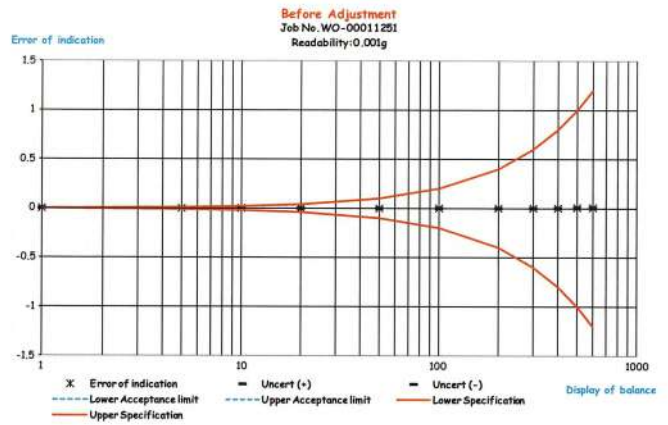
After Adjustment

Readability: 0.001 g

Nominal Value g	Error of Indication g	Guard band (w) g	Tolerance (±) g	Conformity
1	0.000	0.0013	0.002	Pass
5	0.000	0.0013	0.010	Pass
10	0.000	0.0013	0.020	Pass
20	0.000	0.0013	0.040	Pass
50	0.000	0.0013	0.100	Pass
100	0.000	0.0014	0.200	Pass
200	0.000	0.0014	0.400	Pass
300	0.001	0.0015	0.600	Pass
400	0.001	0.0017	0.800	Pass
500	0.000	0.0019	1.000	Pass
600	0.001	0.0021	1.200	Pass

The validity of the statements of conformity cannot be guaranteed for different places of use, environmental conditions or improper use.

The End of Statements of conformity



ใบตรวจสอบสภาพเครื่องชั่ง

เลขที่ใบงาน: WO-00011251

ชนิดเครื่องมือ: Balance

รุ่น: PX623

หมายเลขเครื่อง: C236754745

ตรวจสอบ (วัน)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
07 Dec 2023			07 Dec 2023		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดเกรงกันลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	3. ความสมบูรณ์ชุดของระดับน้ำ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของขาตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การตอบสนองของไม่กด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	7. การแสดงผลของ Display หลังวางน้ำหนัก	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองจานชั่ง (Stopper) / pan support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของตัวเครื่องภายนอกและภายใน load cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติม/ข้อแนะนำ :

Mr. Adisai Maknoi
Service Engineer