



ภาคผนวก ง



เอกสารสอบเทียบเครื่องมือวิเคราะห์



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
Stack								
1	Pre-Test Console	Total Suspended Particulate	Apex Instruments, USA.	XC-572-V 1904013	Envi Equipment Service Co., Ltd.	E24-070051	9 Jul 24	8 Jul 25
2	Flue gas Analyzer	Sulphur Dioxide Oxide of Nitrogen as Nitrogen Dioxide	Testo AG	Testo 350 63373169/0322	Entech Industrial Solution Co., Ltd.	G 670378	7 Jun 24	6 Jul 25

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
Ambient								
1	Orifice Transfer Standard Calibrator	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Tisch Environmental, Inc.	TE-5025A 3383	Jiranaatee Associates Co., Ltd.	COF-039-67	27 Sep 24	26 Sep 25
2	U-Tube Manometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Dwyer	1221-36-W/M -	Technology Promotion Association (Thailand-Japan)	24P1250	10 Apr 24	9 Apr 25
3	Aneroid Barometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24P1369	22 Apr 24	21 Apr 25
4	Dial Thermo-Hygrometer	Total Suspended Particulate (TSP) Particulate Matter < 10 µm (PM ₁₀)	Barigo, Germany	-	Technology Promotion Association (Thailand-Japan)	24H753	10 Apr 24	9 Apr 25
5	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM19050148	UAE Consultant Co., Ltd.	20092024	20 Sep 24	19 Sep 25
6	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM19050149	UAE Consultant Co., Ltd.	17092024	17 Sep 24	16 Sep 25
7	Nitrogen Dioxide Analyzer	Nitrogen Dioxide	Thermo Scientific	42i CM19050150	UAE Consultant Co., Ltd.	17092024	17 Sep 24	16 Sep 25
8	Standard Gases (Mixture)	Nitrogen Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05N91E15A0014	6 Jun 23	6 Jun 31
9	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i CM22387061	UAE Consultant Co., Ltd.	06092024	6 Sep 24	5 Sep 25
10	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i CM22387063	UAE Consultant Co., Ltd.	19062024	19 Jun 24	18 Jun 25
11	Sulphur Dioxide Analyzer	Sulphur Dioxide	Thermo Scientific	43i 1182920014	UAE Consultant Co., Ltd.	04092024	4 Sep 24	3 Sep 25
12	Standard Gases (Mixture)	Sulphur Dioxide	Airgas	EB0162121 2016PSIG	Airgas an Air Liquide company	E05N91E15A0014	6 Jun 23	6 Jun 31
13	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201778117	UAE Consultant Co., Ltd.	09092024	9 Sep 24	8 Sep 25
14	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201778118	UAE Consultant Co., Ltd.	12122024	12 Dec 24	11 Dec 25

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
Ambient								
15	Carbon Monoxide Analyzer	Carbon Monoxide	Thermo	48i 1201778119	UAE Consultant Co.,Ltd.	06122024	6 Dec 24	5 Dec 25
16	Standard Gases (Mixture)	Carbon Monoxide	Airgas	E80162121 2016PSIG	Airgas an Air Liquide company	E05NI91E15A0014	6 Jun 23	6 Jun 31
17	Sound Level Calibrator (Acoustic Calibrator)	Calibrate Sound Level Meter	01dB	CAL31 84065	Innovative Instrument Co.,Ltd.	24-ACT-087	25 Jun 24	24 Jun 25
18	Sound Level Meter	$L_{Aeq} 24\text{ hrs}$ $L_{Aeq} 1\text{ hr}$ L_{Amax} L_{A99} L_{Adn} ระดับเสียงรบกวน	Larson Davis	LxT1 0007309	Electrical And Electronics Institute Foundation For Industrial Development	CP202340287EA	2 Aug 24	1 Aug 25
19	Sound Level Meter	$L_{Aeq} 24\text{ hrs}$ $L_{Aeq} 1\text{ hr}$ L_{Amax} L_{A99} L_{Adn} ระดับเสียงรบกวน	Larson Davis	LxT1 0007310	Electrical And Electronics Institute Foundation For Industrial Development	CP20240289EA	5 Aug 24	4 Aug 25
20	Sound Level Meter	$L_{Aeq} 24\text{ hrs}$ $L_{Aeq} 1\text{ hr}$ L_{Amax} L_{A99} L_{Adn} ระดับเสียงรบกวน	Larson Davis	LxT1 0007312	Electrical And Electronics Institute Foundation For Industrial Development	CP20240288EA	5 Aug 24	4 Aug 25

List of Instruments Certification for Water Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration
Water								
1	pH Meter	pH	Horiba	LAQUA-PH210 HA1G0008	Technology Promotion Association (Thailand-Japan)	24CH1153/1	18 Sep 24	17 Sep 25
2	DO Meter	DO	Horiba	LAQUA-DO210 HE1D0010	Technology Promotion Association (Thailand-Japan)	24TW200	18 Sep 24	17 Sep 25

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
Workplace								
1	Thermal Environment Monitor	Heat Meter	3M	QuesTemp 32 TPS030004	Innovative Instrument Co.,Ltd.	24-TPM-397	3 Sep 24	2 Sep 25
2	Thermal Environment Monitor	Heat Meter	TSI QUEST	QuesTemp 32 TPT030008	Innovative Instrument Co.,Ltd.	24-TPM-395	3 Sep 24	2 Sep 25
3	Thermal Environment Monitor	Heat Meter	3M	QuesTemp 32 TPS030006	Innovative Instrument Co.,Ltd.	24-TPM-396	3 Sep 24	2 Sep 25
4	Thermal Environment Monitor	Heat Meter	TSI QUEST	QuesTemp 34 TEX040017	Innovative Instrument Co.,Ltd.	24-TPM-319	16 Jul 24	15 Jul 25
5	Air Sampling Pump	Total Dust Respirable Dust	Sensidyne	GiAir 5 20170701007	Innovative Instrument Co., Ltd.	24-ASP-221	6 Nov 24	5 Nov 25
6	Air Sampling Pump	Total Dust Respirable Dust	Sensidyne	GiAir 5 20180102008	Calibration Laboratory Co.Ltd	Q24050336	17 May 24	16 May 25
7	Air Sampling Pump	Total Dust Respirable Dust	Sensidyne	GiAir 5 20150602021	Innovative Instrument Co., Ltd.	24-ASP-062	29 May 24	28 May 25
8	Air Sampling Pump	Total Dust Respirable Dust	Sensidyne	GiAir 5 20230601001	Innovative Instrument Co., Ltd.	24-ASP-150	9 Sep 24	8 Sep 25
9	Air Sampling Pump	Total Dust Respirable Dust	Sensidyne	GiAir 5 20200401001	Calibration Laboratory Co.Ltd	Q24050333	17 May 24	16 May 25
10	Air Sampling Pump	Total Dust Respirable Dust	Sensidyne	GiAir 5 20220301018	Innovative Instrument Co., Ltd.	24-ASP-099	28 Jun 24	27 Jun 25
11	Air Sampling Pump	Total Dust Respirable Dust	Sensidyne	GiAir 5 20150602018	Innovative Instrument Co., Ltd.	24-ASP-068	3 Jun 24	2 Jun 25
12	Air Sampling Pump	Total Dust Respirable Dust	Sensidyne	GiAir 5 20220301017	Innovative Instrument Co., Ltd.	24-ASP-101	28 Jun 24	27 Jun 25
13	Air Sampling Pump	Total Dust Respirable Dust	Sensidyne	GiAir 5 20220301020	Innovative Instrument Co., Ltd.	24-ASP-100	28 Jun 24	27 Jun 25
14	Sound Level Meter	$L_{Aeq,8\text{ hr}}$ L_{Amax}	Rion, Japan	NL-43 00730433	Sithiporn Associates Co., Ltd.	ACL24315	9 Oct 24	8 Oct 25

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
Workplace								
15	Sound Level Meter	$L_{Aeq\ 8\ hrs}$, L_{Amax}	Rion, Japan	NL-43 00430295	Sithiporn Associates Co., Ltd.	ACL24275	12 Sep 24	11 Sep 25
16	Sound Level Meter	$L_{Aeq\ 8\ hrs}$, L_{Amax}	Rion, Japan	NL-43 00430294	Sithiporn Associates Co., Ltd.	ACL24274	12 Sep 24	11 Sep 25
17	Sound Level Meter	$L_{Aeq\ 8\ hrs}$, L_{Amax}	Rion, Japan	NL-43 00730428	Sithiporn Associates Co., Ltd.	ACL24311	9 Oct 24	8 Oct 25

Certificate of Calibration

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

Certificate No : 22-ASP-028
Request No : Req-2022-0363

Unit Under Calibration Details

Measurement Item : Air Sampling Pump
Manufacturer : SENSIDYNE
Model : G6Air 5
Serial Number : 20150602021
ID : -

Calibration Environment and Details


Temperature : 23 ± 3 °C
Humidity : 55 ± 15 %RH
Barometric : 1010 \pm 10 hpa
Received Date : 14 February 2022
Calibration Date : 25 February 2022
Calibration By : Mr. Nopadon Luangrat
Location of Calibration : LAB4 Air Velocity
Calibration Procedure : In-house method CP-ASP-01 by Comparison With Standard Air Flow Meter

Reference Standard	Model	Serial Number	Traceable	Due Date
Air Flow Meter	Gilibrator 3 Low flow	1850101006	Sensidyne	21 May 2022
Air flow meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	20 May 2022
Digital Vacuum Meter	Digi Mano	29508	PCAL	6 August 2022

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 %.

Calibration By : 
Service Calibration Engineer

Approved By : 
Mr. Pachi Mahavon
Calibration Engineer Supervisor
Issue Date : 25 February 2022

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.

FM-708-ASP-01 Rev.00 Issue date 01/07/19

เอกสารไม่ควบคุม

Certificate No : 22-ASP-028
Request No : Req-2022-0363

Constant Flow

Result of Calibration :

UUC Flow Setting	STD FLOW READING (cc/min) at							Flow	Uncertainty (cc/min)	Evaluation (Pass / Fail)
(cc/min)	BP 5±1 inH ₂ O	BP 10±1 inH ₂ O	BP 15±1 inH ₂ O	BP 20±1 inH ₂ O	BP 25±1 inH ₂ O	BP 30±1 inH ₂ O	BP 40±1 inH ₂ O	Acceptable Tolerance (cc/min)		
LOW										
20	21.8	21.0	20.8	19.0	21.5	-	-	17-23	1.9	Pass
50	50.0	51.0	50.8	51.0	51.3	-	-	47-53	1.2	Pass
200	199.0	199.5	201.0	202.3	201.8	-	-	190-210	3.4	Pass
300	302.0	301.5	300.5	299.5	301.8	-	-	275-325	7.3	Pass

Note : Reference Specifications $\pm 5\%$ of set flow or ± 3 cc/min whichever is higher

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.

FM-708-ASP-01 Rev.00 Issue date 01/07/19

เอกสารไม่ควบคุม

Certificate No: G 670378
Date of issue : 07-Jun-24

Instrument description : 1 : Flow Gas Analyzer
Instrument model : 1 : Testo 350 New
Control unit serial no. : 1 : 03579717/0322
Instrument serial no. : 1 : 63373169/0322
ID no. or control no. : 1 : UAE.EFM.075/2565 NO.11
Manufacturer : 1 : Testo SE & Co. KGAA
Probe description : 1 : -
Probe model : 1 : -
Probe serial no. : 1 : -
Customer name : 1 : UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Customer address : 1 : 81 SOI UDOMSUK41, SUKHUMVIT ROAD, BANGCHAK PRAKANONG BANGKOK 10260

Total pages of certificate : 3 Pages
Receiving no. : 1 : U-241965
Receiving date. : 1 : 30-May-24

Parameter of calibration : 1 : Gas Calibration (Oxygen 2.50, 10.04, 21.02 %Vol, Carbon Monoxide 80.18, 302.1000 ppm, Nitrogen Dioxide 30.34, 80.96, 201.9 ppm, Nitric Oxide 30.01, 151.5, 322.5 ppm, Sulphur Dioxide 50.36, 100.8, 600.8 ppm)

Condition of UUC. : 1 : Used

Ambient condition : 1 : All of the Measurement were carried out the stabilized laboratory

Temperature : 23 \pm 5 °C
Humidity : 55 \pm 15 %RH

Calibration place : 1 : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Lakki, Bangkok 10210 THAILAND

Calibration procedure no. : 1 : This instrument was calibrated by comparison with Standard gas mixture according to calibration Work Instruction no. WI-CL-28-C

The calibration certificate expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%. This certificate is applied only to item under test Environmental condition.
This Calibration Certificate may not be reproduced other than in full except with the permission of the issuing laboratory.
Calibration certificates without signature and seal not valid and The results relate only to the items tested/calibrated.
This calibration certificate documents are traceability to national standards, which realize measurement according to the International System of Units (SI).

Date of calibration : 07-Jun-24


Mr. Kwandjai Khandoung
Calibration Technician


Mrs. Nongluck Wongsettee
Technical Manager

Certificate No.: G 670378

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O ₂) 2.50 % Vol	2412/23	Linde	27-Aug-27
Oxygen (O ₂) 10.04 % Vol	CG-0153-21	Nimt	18-Feb-26
Oxygen (O ₂) 21.02 % Vol	CG-0094-22	Nimt	18-Feb-27
Carbon monoxide (CO) 80.18 ppm	CG-0002-24	Nimt	11-Jan-29
Carbon monoxide (CO) 302 ppm	1915/23	Linde	16-Jun-25
Carbon monoxide (CO) 1001 ppm	CG-0095-24	Nimt	22-May-29
Nitrogen Dioxide (NO ₂) 30.34 ppm	2703/22	Linde	22-Aug-24
Nitrogen Dioxide (NO ₂) 81.32 ppm	3546/23	Linde	14-Jan-26
Nitrogen Dioxide (NO ₂) 201.9 ppm	1905/23	Linde	17-Jul-25
Nitric Oxide (NO) 30.01 ppm	CG-0014-23	Nimt	19-Feb-29
Nitric Oxide (NO) 151.5 ppm	0161/23	Linde	22-Jan-25
Nitric Oxide (NO) 322.5 ppm	1974/23	Linde	17-Jul-25
Sulphur Dioxide (SO ₂) 50.36 ppm	2004/23	Linde	17-Jul-25
Sulphur Dioxide (SO ₂) 100.8 ppm	3507/22	Linde	09-Nov-24
Sulphur Dioxide (SO ₂) 600.8 ppm	2003/23	Linde	17-Jul-25

Measured room conditions

Temperature : 23.6 °C Humidity : 56.1 %RH Pressure : 1009.8 mbar

Calibration conditions

Gas Temperature : 24 °C Flow rate : 1,200 ml/min Gas pressure : 1015.2 mbar

Calibration Results (Before adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC			Uncertainty
		Values	Error	(1)	
O ₂ (%Vol)	2.50	2.44	-0.06	0.15	
O ₂ (%Vol)	10.04	9.95	-0.09	0.20	
O ₂ (%Vol)	21.02	21.12	0.10	0.30	
CO (ppm)	80.18	80	-0.18	3.0	
CO (ppm)	302	301	-1	6.0	
CO (ppm)	1001	1002	1	12	
NO ₂ (ppm)	30.34	23.6	-6.74	8.0	
NO ₂ (ppm)	81.32	70.1	-11.22	8.0	
NO ₂ (ppm)	201.9	182.5	-19.4	12	
NO (ppm)	30.01	29	-1.01	8.0	
NO (ppm)	151.5	153	1.5	8.0	
NO (ppm)	322.5	323	0.5	12	
SO ₂ (ppm)	50.36	58	7.64	6.0	
SO ₂ (ppm)	100.8	111	10.2	6.0	
SO ₂ (ppm)	600.8	657	56.2	13	

Calibration Results (After adjustment) (Table 3)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O ₂ (%Vol)	2.50	2.44	-0.06	0.15
O ₂ (%Vol)	10.04	9.95	-0.09	0.20
O ₂ (%Vol)	21.02	21.12	0.10	0.30
CO (ppm)	86.18	80	-6.18	1.6
CO (ppm)	302	301	-1	6.0
CO (ppm)	1001	1002	1	12
NO ₂ (ppm)	30.34	28.8	-1.54	8.0
NO ₂ (ppm)	81.32	79.7	-1.62	8.0
NO ₂ (ppm)	201.9	203.1	1.2	12
NO (ppm)	30.01	29	-1.01	8.0
NO (ppm)	151.5	153	1.5	8.0
NO (ppm)	322.5	323	0.5	12
SO ₂ (ppm)	50.36	50	-0.36	6.0
SO ₂ (ppm)	100.8	101	0.2	6.0
SO ₂ (ppm)	600.8	603	2.2	13

Remark: 1 cmc/mol = 1 %vol, 1 µmol/mol = 1 ppm.

End of Report

CERTIFICATE OF ANALYSIS
Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD.
Part Number: E05N01E15A0014
Cylinder Number: E80162121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO,CO₂,NO,NO₂,SO₂,BALN
Reference Number: 160-402772205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 660
Certification Date: Jul 06, 2023
Expiration Date: Jul 06, 2023

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gasoline Calibration Standards (May 2017) document EPA 800R-12051, using the assay procedures listed. Analytical methodology does not require correction for analytical interference. This cylinder has a total analyte uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a maximum basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	160.0 PPM	160.4 PPM	G1	±0.3% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	160.0 PPM	160.2 PPM	G1	±0.3% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	160.0 PPM	160.0 PPM	G1	±0.3% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	±0.3% NIST Traceable	06/27/2023, 07/06/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	±0.3% NIST Traceable	06/27/2023, 07/06/2023
NITROGEN	Balance				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMIS	104202308	CG74354	98.36 PPM NITRIC OXIDE/NITROGEN	±0.4%	Jan 04, 2031
PRM	C2219101	AP1614048	100.19 PPM NITRIC OXIDE/NITROGEN	±0.3%	Feb 28, 2025
GMIS	2622042525	CG754381	98.52 PPM NITRIC OXIDE/NITROGEN	±0.4%	Apr 25, 2031
PRM	12409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	±0.5%	Feb 17, 2023
GMIS	15340020202	E80130037	8.893 PPM NITROGEN DIOXIDE/NITROGEN	±0.6%	Sep 29, 2025
NTRM	160102.22	KAL003820	97.59 PPM SULFUR DIOXIDE/NITROGEN	±0.8%	Nov 01, 2027
CO	230601	CG745602	248.47 PPM CARBON MONOXIDE/NITROGEN	±0.3%	Dec 09, 2028
NTRM	130606-02	CC411730	13.359 % CARBON DIOXIDE/NITROGEN	±0.6%	May 14, 2025

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicotest ISO FTIR AUP2010245 CO ₂	FTIR	Jun 15, 2023
SIEMENS LA TRAMATSE N1-C8-180	NDIR	Jun 14, 2023
Nicotest ISO FTIR AUP2010245 NO	FTIR	Jun 29, 2023
Nicotest ISO FTIR AUP2010245 NO ₂	FTIR	Jun 15, 2023
Nicotest ISO FTIR AUP2010245 SO ₂	FTIR	Jun 08, 2023

Approved for Release

MULTI-POINT GAS TEST REPORT

Test Date : May 7, 2025

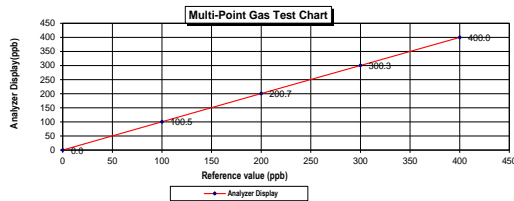
Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM19050148

Standard Gas Concentration	Dilutor Detail
Sulphur Dioxide (SO ₂) 42.89 PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO) 46.77 PPM	Model : 146i
Methane (CH ₄) - PPM	Serial Number : 1180540071
Carbon Monoxide (CO) 965.9 PPM	
Cylinder No. : E80159156	
Expiration Date : Nov 6, 2026	

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero 0.0	0.0	0.00	0.00	0.00
Level 2 20.00%	100.5	0.50	0.50	0.50
Level 3 40.00%	200.7	0.70	0.35	0.35
Level 4 60.00%	300.3	0.30	0.10	0.10
Level 5 80.00%	400.0	0.00	0.00	0.00
Remark : Measuring Range 500.0 ppb		Average Difference (%)		0.19

Acceptable Limit ± 5%



Calculate by

7 / 05 / 2025

Approve by

7 / May / 2025

MULTI-POINT GAS TEST REPORT

Test Date : May 7, 2025

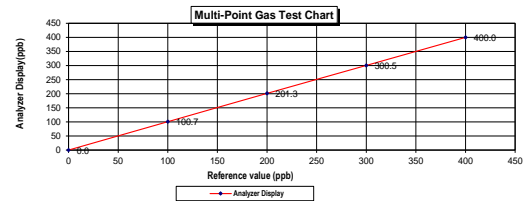
Equipment : Gas Analyzer (NO₂) Model : 42i
Manufacturer : Thermo Scientific Serial Number : CM19050149

Standard Gas Concentration	Dilutor Detail
Sulphur Dioxide (SO ₂) 42.89 PPM	Manufacturer : Thermo Scientific
Nitric Oxide (NO) 46.77 PPM	Model : 146i
Methane (CH ₄) - PPM	Serial Number : 1180540071
Carbon Monoxide (CO) 965.9 PPM	
Cylinder No. : E80159156	
Expiration Date : Nov 06, 2026	

Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1 Zero 0.0	0.0	0.00	0.00	0.00
Level 2 20.00%	100.7	0.70	0.70	0.70
Level 3 40.00%	201.3	1.30	0.65	0.65
Level 4 60.00%	300.5	0.50	0.17	0.17
Level 5 80.00%	400.0	0.00	0.00	0.00
Remark : Measuring Range 500.0 ppb		Average Difference (%)		0.30

Acceptable Limit ± 5%



Calculate by

7 / 05 / 2025

Approve by

7 / May / 2025

MULTI-POINT GAS TEST REPORT

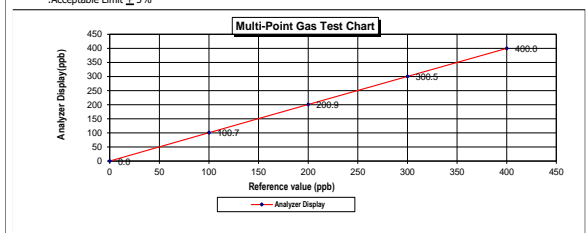
Test Date : May 7, 2025

Equipment : Gas Analyzer (NO₂) Model : 421
Manufacturer : Thermo Scientific Serial Number : CM19050150

Standard Gas Concentration

Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo Scientific
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB0159156			
Expiration Date :	Nov 06, 2026			

Multi-point gas test data					
	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	0.70	0.70	0.70
Level 3	40.00%	200.0	0.90	0.45	0.45
Level 4	60.00%	300.0	0.50	0.17	0.17
Level 5	80.00%	400.0	0.00	0.00	0.00
Remark : Measuring Range	500.0 ppb		Average Difference (%)		0.26



Calculate by : *[Signature]* 7 / 05 / 2025
Approve by : *[Signature]* 7 / May / 2025



Certificate of Calibration

Cert.No.: 24CH1153/1
Page.: 1 of 3

This Certificate was issued to replace to the Certificate No. 24CH1153

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA1G0008
ID No. : UAE.EFM.201/2564(EFM.pH.09/64)
Condition As-Received: Used Item
Received Date : 17 September 2024
Calibration Date : 18 September , 25 October 2024
Reference : 2409-0632WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : (25 \pm 2.5) °C
Relative Humidity : (50 \pm 15) %
Calibration Procedure :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lernagatrakul

Approved by : *[Signature]*
Approved Signatory

() Unnophol Harachai
() Ponpan Paipim
(✓) Saithip Meangmai

Issue Date : 28 October 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.



Cert.No.: 24CH1153/1
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	24E2759	25 Aug 2025
2) Ref. Standard Thermometer	4982054	110RC044	24I757	14 July 2025

- This Certification is traceable to SI Through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials

:The measurement results are traceable to SI through Hach Lenge GmbH Ltd., Deutsche Akkreditierungsstelle, Accredited No.D-RM-15184-01-00
: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 4.006	Hach Lenge GmbH	C03146	23 Feb 2026
pH 7.000	Hach Lenge GmbH	C03020	13 Dec 2024
pH 9.997	CPA chem	970853	25 Apr 2025

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 Document Process Calibrator at pH (4,7)(7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input		Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
		pH	mV	mV	pH		
pH Meter S/N.: HA1G0008	4.00	177.48	177.5	4.01	0.058	2.00	
	7.00	0.00	0.0	7.02	0.058	2.00	
	7.00	0.00	0.0	7.02	0.058	2.00	
	10.00	-177.48	-177.5	10.01	0.058	2.00	

Calibration Results

Function : pH Measurement

Calibration Date : 18 September 2024

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 (\pm)	Coverage factor k
pH Electrode S/N.: -	4.006	4.01	168.7	0.0077	2.00
	7.000	6.99	-3.2	0.0084	2.00
	7.000	7.00	-3.4	0.0092	2.05
	9.997	10.01	-174.4	0.011	2.05

Function : Temperature Measurement

Calibration Date : 25 October 2024

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9652
- Serial No. :
Dimension of probe
- Length : 103 mm.
- Diameter : 16 mm.
- Immersion Depth : 90 mm.

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (\pm °C)	Coverage factor k
20.0	20.001	20.0	-0.001	0.13	2.00
25.0	25.005	25.0	-0.005	0.13	2.00
45.0	45.004	44.9	-0.104	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 %.



CALIBRATION LABORATORY CO., LTD.

27/0-11, 34, 55 Soi Praset Mueang 29 Yek 4 Praset Mueang 91, Jiraprasit, Bangkok 10200
Tel. 02-578-3333-4 Fax. 02-578-3332-3 Email: info@clclab.co.th



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : AIR SAMPLING PUMP
MANUFACTURER : SENSIDYNE
MODEL / TYPE : GILAIR-5
SERIAL NO. : 20180102008 [UAE,EFM,091/2561]
CLID. NO. : 212400757
JOB CONTROL NO. : 240515050336
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
R1, SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK, PHRAKHAMONG, BANGKOK 10260

DATE OF RECEIVED : 15 May 2024

DATE OF ISSUED : 21 May 2024

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

Calibrated By : Supphakiet Sakuntabhai
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
21 May 2024

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

Certificate No. Q24050336
F3-011-05-12-27

เอกสารไม่ควบคุม



CALIBRATION LABORATORY CO., LTD.

27/0-11, 34, 55 Soi Praset Mueang 29 Yek 4 Praset Mueang 91, Jiraprasit, Bangkok 10200
Tel. 02-578-3333-4 Fax. 02-578-3332-3 Email: info@clclab.co.th



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The table in the following gives the calibration results and associated measurement uncertainties at the measuring air sampling pump.

CALIBRATION DATA

AIR SAMPLING PUMP RESULT

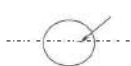
DUT Setting (ppm)	STD Reading (ppm)	Correction (ppm)	Coverage factor k
1.0	1.10	+0.10	2.00
1.5	1.62	+0.12	3.00
2.0	2.12	+0.12	3.00
2.5	2.63	+0.13	2.00
3.0	3.10	+0.10	3.00
4.0	3.98	+0.02	2.00
5.0	4.98	0.02	2.00

Uncertainty of measurement is ± 0.14 ppm

Technical Note, Model of Gas : Air

Note: The Scope of Accredited: ANAB Certificate No. ACD01-2024 Version 012 Page 46 of 67

Revising



This report is valid for the above stated measurements only.

End of Certificate 900

Certificate No. Q24050336
F3-011-05-12-23

เอกสารไม่ควบคุม



CALIBRATION LABORATORY CO., LTD.

27/0-11, 34, 55 Soi Praset Mueang 29 Yek 4 Praset Mueang 91, Jiraprasit, Bangkok 10200
Tel. 02-578-3333-4 Fax. 02-578-3332-3 Email: info@clclab.co.th



REPORT OF CALIBRATION

FOR

NOMENCLATURE : AIR SAMPLING PUMP
MANUFACTURER : SENSIDYNE
MODEL / TYPE : GILAIR-5
SERIAL NO. : 20180102008 [UAE,EFM,091/2561]
DATE OF CALIBRATION : 17 May 2024

ENVIRONMENT CONDITIONS :

Temperature : $(21 \pm 2) ^\circ\text{C}$

Relative Humidity : $45 \pm 10\% \text{ RH}$

PROCEDURE USED :

The instrument was calibrated under procedure No. CLC-CPE-03. The calibration was performed by comparison with a Flow Meter which refers to the standard condition of 101.325 kPa and 0 $^\circ\text{C}$.

REFERENCE STANDARD USED :

5-Axis Metro-Air Scientific Model M-5SL-01-D015-SN.261330

TRACEABILITY :

The measurements are traceable to International System of Units (SI) through Calibration Certificate No. N001064 Date Date 26 February 2015.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor which is a value which for a normal distribution corresponds to a coverage probability of approximately 95%. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration" (JG 1-2012).

Certificate No. Q24050336
F3-011-05-12-23

เอกสารไม่ควบคุม

Page 2 of 4



United Analyst and Engineering Consultant Co., Ltd.

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

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

MULTI-POINT GAS TEST REPORT

Test Date : May 15, 2025

Equipment : Gas Analyzer (SO₂) Model : 431
Manufacturer : Thermo SCIENTIFIC Serial Number : CM22387061

Standard Gas Concentration

Sulphur Dioxide (SO₂) : 42.89 PPM
Nitric Oxide (NO) : 46.77 PPM
Methane (CH₄) : - PPM
Carbon Monoxide (CO) : 965.9 PPM
Cylinder No. : EB01159156
Expiration Date : Nov 06, 2026

Dilutor Detail

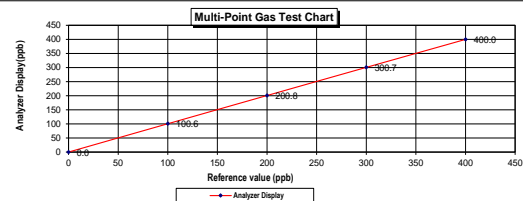
Manufacturer : Thermo SCIENTIFIC
Model : 1461
Serial Number : 1180540071

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	0.60	0.60	0.60
Level 3	40.00%	200.0	0.80	0.40	0.40
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
Acceptable Limit $\pm 5\%$

Average Difference (%) : 0.25



Calculate by

Signature :
15 / 05 / 2025

Approve by

Signature :
15 / May / 2025

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : May 12, 2025

Equipment : Gas Analyzer (SO₂) **Model** : 43i
Manufacturer : Thermo SCIENTIFIC **Serial Number** : CM22387063

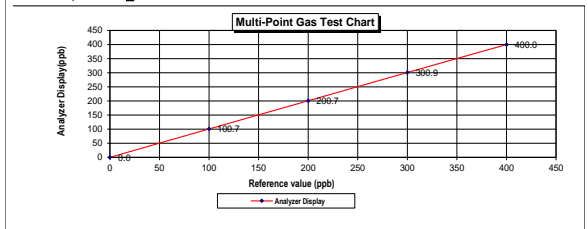
Standard Gas Concentration **Dilutor Detail**

Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB01159156			
Expiration Date :	Nov 06, 2026			

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.7	0.70	0.70
Level 3	40.00%	200.0	200.7	0.35	0.35
Level 4	60.00%	300.0	300.9	0.30	0.30
Level 5	80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range	500.0 ppb		Average Difference (%)	0.27	

:Acceptable Limit $\pm 5\%$



Calculate by *[Signature]* **Approve by** *[Signature]*
12/.....05/.....2025.....12/.....May/.....2025

MULTI-POINT GAS TEST REPORT

Test Date : Sep 4, 2024

Equipment : Gas Analyzer (SO₂) **Model** : 43i
Manufacturer : Thermo SCIENTIFIC **Serial Number** : 1182920014

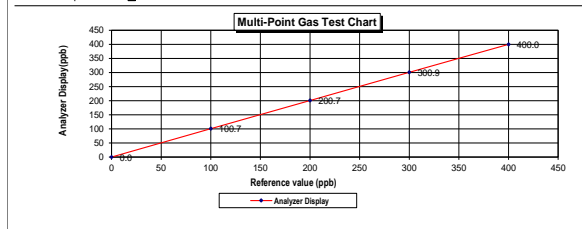
Standard Gas Concentration **Dilutor Detail**

Sulphur Dioxide (SO ₂)	42.89	PPM	Manufacturer :	Thermo SCIENTIFIC
Nitric Oxide (NO)	46.77	PPM	Model :	146i
Methane (CH ₄)	-	PPM	Serial Number :	1180540071
Carbon Monoxide (CO)	965.9			
Cylinder No. :	EB01159156			
Expiration Date :	Nov 06, 2026			

Multi-point gas test data

	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.0	0.00	0.00	0.00
Level 2	20.00%	100.0	100.7	0.70	0.70
Level 3	40.00%	200.0	200.7	0.35	0.35
Level 4	60.00%	300.0	300.9	0.30	0.30
Level 5	80.00%	400.0	400.0	0.00	0.00
Remark : Measuring Range	500.0 ppb		Average Difference (%)	0.27	

:Acceptable Limit $\pm 5\%$



Calculate by *[Signature]* **Approve by** *[Signature]*
4/.....9/.....2567.....4/.....Sep/.....2024

Certificate of Calibration

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

Certificate No : 22-ASP-030
Request No : Req-2022-0364

Unit Under Calibration Details

Measurement Item : Air Sampling Pump
Manufacturer : SENSODYNE
Model : GilAir 5
Serial Number : 20200401001
ID : -

Calibration Environment and Details

Temperature : 23 \pm 3 °C
Humidity : 55 \pm 15 %RH
Barometric : 1010 \pm 10 hpa
Received Date : 14 February 2022
Calibration Date : 25 February 2022
Calibration By : Mr. Noppadol Luangart
Location of Calibration : LAB4 Air Velocity
Calibration Procedure : In-house method CP-ASP-01 by Comparison With Standard Air Flow Meter

Reference Standard	Model	Serial Number	Traceable	Due Date
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensodyne	21 May 2022
Air flow meter	Gilibrator 3 Standard flow	19031011003	Sensodyne	20 May 2022
Digital Vacuum Meter	Digi Mate	29508	PCAL	6 August 2022

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 %.

Calibration By : *[Signature]*
Service Calibration Engineer

Approved By : *[Signature]*
Mr. Patch Mahavorn
Calibration Engineer Supervisor
Issue Date : 25 February 2022

Certificate No : 22-ASP-030
Request No : Req-2022-0364

Constant Flow		Result of Calibration :								Evaluation
UUC Flow Setting	STD FLOW READING (cc/min) at						Flow Acceptable Tolerance (cc/min)	Uncertainty (cc/min)		
(cc/min)	BP 5±1 inH ₂ O	BP 10±1 inH ₂ O	BP 15±1 inH ₂ O	BP 20±1 inH ₂ O	BP 25±1 inH ₂ O	BP 30±1 inH ₂ O	BP 40±1 inH ₂ O	(cc/min)	(Pass / Fail)	
LOW										
20	20.8	20.8	21.0	20.8	21.5	-	-	17 - 23	1.2 Pass	
50	51.0	51.0	52.0	52.0	51.3	-	-	47 - 53	2.0 Pass	
200	200.8	201.5	202.3	201.8	202.5	-	-	190 - 210	3.1 Pass	
500	501.3	501.5	502.3	501.8	502.3	-	-	475 - 525	7.2 Pass	

Note : - Reference Specifications $\pm 5\%$ of set flow or ± 3 cc/min whichever is higher

End of Certificate

Certificate of Calibration

Customer

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

Certificate No : 24-ACT-087
Request No : Req-2024-1365

Unit Under Calibration Details

Measurement Item : Acoustic Calibration
Manufacturer : 91dB
Model : CAL31
Serial Number : 84065
ID : UAE.EFM.167/2561
Class : 1
Range : 94 dB / 1000 Hz
Instrument Status : Used

Calibration Environment and Details

Temperature : (23 ± 2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ± 10.0 hPa)
Received Date : 29 June 2024
Calibration Date : 25 June 2024
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	EET	12 June 2025
THD Multimeter	2915	1047765	NIMT	16 January 2025

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. Noppadol Luangat
Service Calibration Engineer

Approved By : 
Mr. Pachi Muthavorn
Calibration Engineer Supervisor
Issue Date : 25 June 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.
PIM-708-ACT-02 Rev.03 Issue date 5/6/24

เอกสารไม่ควบคุม

Certificate No : 24-ACT-087
Request No : Req-2024-1365

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)	Result
	Measured	Deviated value	Measured	Deviated value			
94 dB / 1000 Hz	93.78	-0.22	-	-	0.13	0.25	Pass

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)	Result
	Measured (Hz)	Deviated	Measured (Hz)	Deviated			
94 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70	Pass

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

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty (± %)	Acceptance limit Class 1 (± %)	Result
	Measured (%)	Measured (%)			
94 dB / 1000 Hz	0.14	-	0.40	2.5	Pass

Note :

Function	Maximum-permitted Uncertainty of measurement
Sound pressure level	0.15 dB
Frequency	0.20%
Total distortion+noise	0.50%

• Assurance limit was IEC60942:2017 Class 1

• The calibration results exclude the calibration pressure correction

• The calibration results exclude the microphone volume correction

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.
PIM-708-ACT-02 Rev.03 Issue date 5/6/24

เอกสารไม่ควบคุม

Certificate No : 24-ACT-087
Request No : Req-2024-1365

Decision Rule for Statements of Conformity

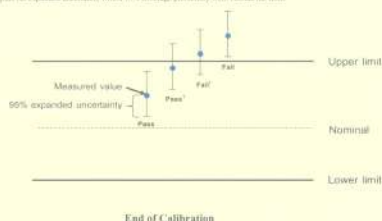
The standard decision rule employed for the statements of conformity to such calibration result will be applied using ILAC-G8:2018. Guidelines on the Reporting of Conformity with Specification as following Fig. and statement.

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

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

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

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



The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.
PIM-708-ACT-02 Rev.03 Issue date 5/6/24

เอกสารไม่ควบคุม

Certificate of Calibration

Customer

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

Certificate No : 24-ASP-068
Request No : Req-2024-1132

Unit Under Calibration Details

Measurement Item : Air Sampling Pump
Manufacturer : SENSODYNE
Model : G6/Air 5
Serial Number : 2015062018
ID : UAE.EFM.0122558
Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 1 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 21 May 2024
Calibration Date : 3 June 2024
Calibration Procedure : In-house method CP-ASP-01 based on ISO 13137 by Comparison With Standard Air Flow Meter

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Calibrator 3 Standard flow	19011011003	Sensodyne	12 July 2024
Digital Thermometer with Probe	GT11	00000057	Q Reborn	1 March 2024
Barometer	CPG2400	410006/DU/051882	TPA	9 November 2024

Traceability :

This Certificate is traceable to SI Unit through Sensodyne A21 A Accreditation No. 3843.01

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. Noppadol Luangat
Service Calibration Engineer

Approved By : 
Mr. Pachi Muthavorn
Calibration Engineer Supervisor
Issue Date : 3 June 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the laboratory.
PIM-708-ASP-02 Rev.03 Issue date 03/07/19

เอกสารไม่ควบคุม

Certificate No : 24-ASP-100
Request No : Req-2024-1326

Result of Calibration : HI

Temperature (°C)	Pressure (kPa)	STD (l/min)	UUC (l/min)	Error (l/min)	Error (l/min, %)	**Allowable Range (l/min, %)	***Back Pressure (lbf./ft. ²)	Uncertainty (l/min)
24.20	99.19	1.008	1.000	-0.008	-0.8%	5 (%)	5	0.016
24.20	96.72	1.029	1.000	-0.020	-2%	5 (%)	15	0.017
24.20	93.08	1.040	1.000	-0.040	-3.8%	5 (%)	30	0.017
24.80	99.19	1.707	1.700	-0.007	-0.4%	5 (%)	5	0.027
24.80	96.68	1.714	1.700	-0.014	-0.8%	5 (%)	15	0.028
24.80	92.90	1.718	1.700	-0.018	-1%	5 (%)	30	0.027
24.70	99.18	2.018	2.000	-0.018	-0.9%	5 (%)	5	0.029
24.70	96.62	2.041	2.000	-0.041	-2%	5 (%)	15	0.029
24.70	92.99	2.040	2.000	-0.040	-2%	5 (%)	30	0.030
24.60	99.14	2.509	2.500	-0.009	-0.4%	5 (%)	5	0.040
24.60	96.67	2.522	2.500	-0.022	-0.9%	5 (%)	15	0.040
24.60	92.89	2.510	2.500	-0.010	-0.4%	5 (%)	30	0.040
24.50	99.16	3.024	3.000	-0.024	-0.8%	5 (%)	5	0.048
24.50	96.59	3.050	3.000	-0.050	-1.6%	5 (%)	15	0.048
24.50	94.11	3.062	3.000	-0.062	-2%	5 (%)	25	0.048
24.00	99.11	4.007	4.000	-0.007	-0.2%	5 (%)	5	0.064
24.00	97.67	4.075	4.000	-0.075	-1.8%	5 (%)	10	0.064
24.00	95.16	4.125	4.000	-0.125	-3%	5 (%)	20	0.064
24.50	99.30	5.029	5.000	-0.029	-0.6%	5 (%)	5	0.080
24.50	97.84	5.134	5.000	-0.134	-2.6%	5 (%)	10	0.080

Note : STD = Standard UUC = Unit Under Calibration
- UUC Reference Condition : At 25 °C, 101.3 kPa, Air
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where : Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

Note :
* Indicates non accredited
** Reference Specifications : ± 5% of set flow or ± 3 column whichever is higher
*** Specified in ISO 13137, Back Pressure control : ± 1 mbar

End of Certificate

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.
FM-708-AFM-01 Rev.03 Issue date 01/07/19

Certificate of Calibration

Certificate No : 24-ASP-101
Request No : Req-2024-1331

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomak 41, Sakhumvit Road, Bangkok, Prakaneng, Bangkok 10260

Unit Under Calibration Details

Measurement Item : Air Sampling Pump
Manufacturer : SENSIDYNE
Model : GGAir 5
Serial Number : 2022001017
ID : UAE.EFM.096/2568

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 kPa ± 10 kPa
Received Date : 19 June 2024
Calibration Date : 28 June 2024
Calibration Procedure : In-house method CP-ASP-01 based on ISO 11137 by Comparison With Standard Air Flow Meter

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Digital Thermometer with Probe	GT11	08000057	Q.Reborn	1 March 2024
Barometer	CPG2406	41000KDU631882	TPA	9 November 2024

Traceability :
This Certificate is traceable to SI Unit through Sensidyne, A2LA Accreditation No. 3943.01
Note :
The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %

Calibration By : Mr. Nopphon Luangnit
Service Calibration Engineer

Approved By : Mr. Pachi Mathavorn
Calibration Engineer Supervisor
Issue Date : 28 June 2024

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.
FM-708-AFM-01 Rev.03 Issue date 01/07/19

เอกสารไม่ควบคุม

Certificate No : 24-ASP-101
Request No : Req-2024-1331

Result of Calibration : HI

Temperature (°C)	Pressure (kPa)	STD (l/min)	UUC (l/min)	Error (l/min)	Error (l/min, %)	**Allowable Range (l/min, %)	***Back Pressure (lbf./ft. ²)	Uncertainty (l/min)
24.50	99.08	1.709	1.700	-0.009	-0.5%	5 (%)	5	0.027
24.50	96.53	1.660	1.700	0.040	2.4%	5 (%)	15	0.027
24.50	93.80	1.683	1.700	0.017	1%	5 (%)	30	0.027
24.60	99.07	2.019	2.000	-0.019	-0.9%	5 (%)	5	0.029
24.60	96.53	1.985	2.000	0.015	0.8%	5 (%)	15	0.029
24.60	92.88	2.007	2.000	-0.007	-0.3%	5 (%)	30	0.029
24.70	99.06	2.507	2.500	-0.007	-0.3%	5 (%)	5	0.040
24.70	96.58	2.474	2.500	0.026	1.1%	5 (%)	15	0.040
24.70	92.83	2.501	2.500	-0.001	-0.1%	5 (%)	30	0.042
24.80	99.10	3.022	3.000	-0.022	-0.7%	5 (%)	5	0.048
24.80	96.51	3.091	3.000	-0.091	-3%	5 (%)	15	0.048
24.80	94.08	3.044	3.000	-0.044	-1.4%	5 (%)	25	0.048
24.90	99.03	4.008	4.000	-0.008	-0.2%	5 (%)	5	0.064
24.90	97.80	4.050	4.000	-0.050	-1.2%	5 (%)	10	0.064
24.90	95.29	4.165	4.000	-0.165	-4%	5 (%)	20	0.064
24.80	99.00	5.033	5.000	-0.033	-0.7%	5 (%)	5	0.080
24.80	97.74	5.136	5.000	-0.136	-2.6%	5 (%)	10	0.080

Note : STD = Standard UUC = Unit Under Calibration
- UUC Reference Condition : At 25 °C, 101.3 kPa, Air
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where : Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
Meas = Measurement Condition ref = Standard Condition

Note :
* Indicates non accredited
** Reference Specifications : ± 5% of set flow or ± 3 column whichever is higher
*** Specified in ISO 13137, Back Pressure control : ± 1 mbar

End of Certificate

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.
FM-708-AFM-01 Rev.03 Issue date 01/07/19

Certificate of Calibration

Certificate No : 24-ASP-130
Request No : Req-2024-1940

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address : 81 Soi Udomak 41, Sakhumvit Road, Bangkok, Prakaneng, Bangkok 10260

Unit Under Calibration Details

Measurement Item : Air Sampling Pump
Manufacturer : SENSIDYNE
Model : GGAir 5
Serial Number : 20230801001
ID : UAE.EFM.139/2566

Location of Calibration : LAB 4 AIR VELOCITY METER

Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH
Barometric Pressure : 1013 kPa ± 10 kPa
Received Date : 28 August 2024
Calibration Date : 9 September 2024
Calibration Procedure : In-house method CP-ASP-01 based on ISO 13137 by Comparison With Standard Air Flow Meter

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	2 August 2025
Digital Thermometer with Probe	GT11	08000057	Q.Reborn	1 March 2025
Barometer	CPG2406	41000KDU651882	TPA	9 November 2024

Traceability :
This Certificate is traceable to SI Unit through Sensidyne, A2LA Accreditation No. 3943.01
Note :
The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k = 2, providing a level of confidence approximately 95 %

Calibration By : Mr. Nopphon Luangnit
Service Calibration Engineer

Approved By : Mr. Pachi Mathavorn
Calibration Engineer Supervisor
Issue Date : 9 September 2024

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.
FM-708-AFM-01 Rev.03 Issue date 18/8/24

เอกสารไม่ควบคุม



Certificate No : 24-ASP-150
Request No : Req-2024-1940

Result of Calibration : High(Without Adjustment)

Temperature (°C)	Pressure (kPa)	STD (l/min)	UUC (l/min)	Error (l/min)	Error (l/min, %)	MPE (l/min, %)	**Back Pressure (mH ₂ O)	Uncertainty (l/min)	Result
24.10	99.41	1.007	1.000	-0.007	-0.7 %	5 (%)	5	0.0161	Pass
24.10	95.52	0.989	1.000	0.011	1.1 %	5 (%)	20	0.0158	Pass
24.10	91.71	1.029	1.000	-0.020	-2 %	5 (%)	35	0.0163	Pass
24.10	99.39	1.704	1.700	-0.004	-0.2 (%)	5 (%)	5	0.027	Pass
24.10	95.59	1.642	1.700	0.058	3.5 (%)	5 (%)	20	0.027	Pass
24.10	93.01	1.624	1.700	0.076	4.7 (%)	5 (%)	30	0.027	Pass
24.20	99.35	2.011	2.000	-0.011	-0.5 (%)	5 (%)	5	0.032	Pass
24.20	95.52	1.957	2.000	0.043	2.2 (%)	5 (%)	20	0.031	Pass
24.20	93.01	1.935	2.000	0.065	3.4 (%)	5 (%)	30	0.031	Pass
24.20	99.30	2.505	2.500	-0.005	-0.2 (%)	5 (%)	5	0.040	Pass
24.20	95.55	2.487	2.500	0.013	0.5 (%)	5 (%)	20	0.071	Pass
24.20	92.92	2.465	2.500	0.035	1.4 (%)	5 (%)	30	0.039	Pass
24.30	99.29	3.016	3.000	-0.016	-0.5 (%)	5 (%)	5	0.048	Pass
24.30	95.30	3.003	3.000	-0.003	-0.1 (%)	5 (%)	20	0.048	Pass
24.30	93.03	2.986	3.000	0.014	0.5 (%)	5 (%)	30	0.048	Pass
24.30	99.28	4.005	4.000	-0.005	-0.1 (%)	5 (%)	5	0.064	Pass
24.30	98.02	4.000	4.000	0.000	0 (%)	5 (%)	10	0.064	Pass
24.30	95.48	4.083	4.000	-0.083	-2 %	5 (%)	20	0.065	Pass
24.30	99.28	5.003	5.000	-0.003	-0.1 %	5 (%)	5	0.080	Pass
24.30	98.11	4.973	5.000	0.027	0.5 %	5 (%)	10	0.080	Pass

Note : STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At 25 °C, 101.3 kPa, Air
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P} \times \frac{T_{meas}}{T_{ref}}$$

where : Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
meas = Measurement Condition ref = Standard Condition

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.

FM-708-AFM-01 Rev.03 issue date 16/6/24



Certificate No : 24-ASP-150
Request No : Req-2024-1940

Note

* Indicates non accredited
** Specified in ISO 13137, Back Pressure control ± 1 mH₂O
MPE = Maximum Permissible Error (Specified in Manufacturer's Specification)

Decision Rule for Statements of Conformity

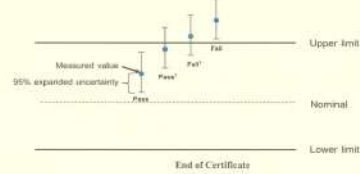
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC G8:08/2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

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

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

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



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.

FM-708-AFM-01 Rev.03 issue date 16/6/24



Certificate of Calibration

Certificate No : 24-ASP-221
Request No : Req-2024-2242

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

Unit Under Calibration Details

Measurement Item : Air Sampling Pump
Manufacturer : SENSIDYNE
Model : Gilaire 5
Serial Number : 20170701007
ID : UAEJFM.028/2560

Location of Calibration : LAB 4 AIR VELOCITY METER

Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 35 %RH ± 20 %RH
Barometric Pressure : 1013 kPa ± 10 kPa
Received Date : 24 September 2024
Calibration Date : 6 November 2024
Calibration Procedure : In-house method CP-ASP-01 based on ISO 13137 by Comparison With Standard Air Flow Meter

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Standard flow	19011011003	Sensidyne	2 August 2025
Digital Thermometer with Probe	GT11	08000057	Q-Reborn	1 March 2025
Barometer	CPQ2400	41000KDU651882	TPA	21 October 2025

Traceability : This Certificate is traceable to SI Unit through Sensidyne AZLA Accreditation No. 3943.01

Note :

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

Calibration By : Mr. Noppakorn Luangon
Service Calibration Engineer

Approved By : Mr. Paich Matharom
Calibration Engineer Supervisor
Issue Date : 6 November 2024

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.

FM-708-AFM-01 Rev.03 issue date 16/6/24



Certificate No : 24-ASP-221
Request No : Req-2024-2242

Result of Calibration : High(Without Adjustment)

Temperature (°C)	Pressure (kPa)	STD (l/min)	UUC (l/min)	Error (l/min)	Error (l/min, %)	MPE (l/min, %)	**Back Pressure (mH ₂ O)	Uncertainty (l/min)	Result
23.90	99.72	1.010	1.000	-0.010	-1 %	5 (%)	5	0.0162	Pass
23.90	95.79	1.024	1.000	-0.024	-2.4 %	5 (%)	20	0.0164	Pass
23.90	92.02	1.051	1.000	-0.051	-4.9 %	5 (%)	35	0.0168	Pass
23.80	99.67	1.703	1.700	-0.003	-0.2 (%)	5 (%)	5	0.027	Pass
23.80	95.92	1.713	1.700	-0.013	-0.8 (%)	5 (%)	20	0.027	Pass
23.80	93.38	1.750	1.700	-0.050	-2.9 (%)	5 (%)	30	0.028	Pass
23.90	99.67	2.011	2.000	-0.011	-0.5 (%)	5 (%)	5	0.032	Pass
23.90	95.89	2.017	2.000	-0.017	-0.8 (%)	5 (%)	20	0.032	Pass
23.90	93.42	2.040	2.000	-0.040	-2 (%)	5 (%)	30	0.033	Pass
23.90	99.65	2.508	2.500	-0.008	-0.3 (%)	5 (%)	5	0.040	Pass
23.90	95.89	2.512	2.500	-0.012	-0.5 (%)	5 (%)	20	0.040	Pass
23.90	93.42	2.534	2.500	-0.034	-1.3 (%)	5 (%)	30	0.041	Pass
23.90	99.66	3.013	3.000	-0.013	-0.4 (%)	5 (%)	5	0.048	Pass
23.90	95.92	3.041	3.000	-0.041	-1.3 (%)	5 (%)	20	0.049	Pass
23.90	93.18	3.093	3.000	-0.093	-3 (%)	5 (%)	30	0.049	Pass
23.90	99.65	4.004	4.000	-0.004	-0.1 (%)	5 (%)	5	0.064	Pass
23.90	98.40	4.011	4.000	-0.011	-0.3 (%)	5 (%)	10	0.064	Pass
23.90	95.92	4.101	4.000	-0.101	-2.5 %	5 (%)	20	0.066	Pass
23.80	99.65	5.002	5.000	-0.002	0 %	5 (%)	5	0.080	Pass
23.80	98.26	5.059	5.000	-0.059	-1.2 %	5 (%)	10	0.081	Pass

Note

STD : Standard UUC : Unit Under Calibration
- UUC Reference Condition : At 25 °C, 101.3 kPa, Air
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P} \times \frac{T_{meas}}{T_{ref}}$$

where : Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
meas = Measurement Condition ref = Standard Condition

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.

FM-708-AFM-01 Rev.03 issue date 16/6/24

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Certificate No.: 24-ASP-221
Request No.: Req-2024-2242

Note

* Indicates non accredited

** Specified in ISO 11317, Back Pressure control ± 1 inH2O

MPE = Maximum Permissible Error (Specified in Manufacturer's Specification)

Decision Rule for Statements of Conformity

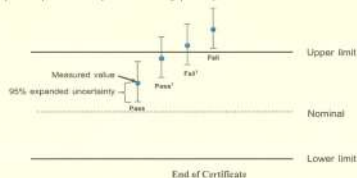
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09:2019, Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

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

Pass² = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

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

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



End of Certificate

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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.

FM-708-AFM-01 Rev.03 Issue date: 36/11/24



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 24HT53
Page: 1 of 2

Equipment : Dial Thermo-Hygrometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE ANV.127/2550

Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 10 April 2024
Reference: 2404-0247WSC
Ambient Temperature: (25 \pm 3) °C
Relative Humidity: (50 \pm 20) %

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.

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) Chilled Mirror Hygrometer	Dew Master	44730	21656	02 Aug 2024
2) Handheld Thermometer With Sensor	1521	A5A339	2311238	16 Oct 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:-
-Thunder Scientific Corporation, NVLAB Accreditation No. Calibration 200562-0
-Technology Promotion Association (Thailand-Japan), NSC-ONSC Accredited No. Calibration 0008

Calibrated by: Chakrit Waewwanjua
Issue Date: 18 April 2024

Approved Signatory :
[] Chakrit Waewwanjua
[✓] Vipom Tantiyawutti
[] Unnopphol Harachai

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Cert. No.: 24HT53
Page: 2 of 2

Result of Calibration:- Without 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	43	2.9	1.6
25.0	60.0	60	0.0	1.7
25.0	80.0	78	-2.0	1.8

Result of Calibration:- Without Adjustment
Function: Temperature Measurement.

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (\pm °C)
20.014	20.0	-0.014	0.72
25.033	25.0	-0.033	0.72
30.010	30.0	-0.010	0.72
35.027	34.5	-0.527	0.72
40.013	39.5	-0.513	0.72

UUC* : Unit Under Calibration

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

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484

Certificate of Calibration

Certificate No.: 24P1250
Page: 1 of 2

Equipment : U Tube Manometer
Manufacturer: Dwyer
Model : 1221-36-W/M
Serial No.: -
ID No.: UAE EFM.076/2566

Condition As-Received: Used Item
Received Date: 03 April 2024
Calibration Date: 10 April 2024

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.

Reference: 2404-0118WSC
Ambient Temperature: (23 \pm 2) °C
Relative Humidity: (50 \pm 15) %
Atmospheric Pressure: 1007 mbar
Submitted by: United Analyst and Engineering Consultant Co.,Ltd.
81 Soi Udomsuk 41, Sukhumvit Road, Bangchak,
Phrakhanong, Bangkok 10260

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

Condition of this result of calibration

1.Reference standards instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Pressure Calibrator	PC106P	1189	MP-0176-23	12 Sep 2024

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), NSC-ONSC Accredited No. Calibration 0144

Calibrated by: Suksan Khankaew
Issue Date: 17 April 2024

Approved Signatory :
[] Phalinee Prabpaipal
[] Sura Suwannasri
[✓] Attapoi Panurach

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Cert.No.: 24P1250
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 Second Estimate)

Applied Pressure	High-port side	Low-port side	ΔP	Error
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	5.05	-4.95	10.00	0.00
12.00	6.05	-5.95	12.00	0.00
14.00	7.05	-6.95	14.00	0.00
16.00	8.10	-7.95	16.05	0.05
18.00	9.10	-8.95	18.05	0.05
20.00	10.10	-9.95	20.05	0.05
22.00	11.10	-10.95	22.05	0.05
24.00	12.10	-11.95	24.05	0.05
26.00	13.15	-12.95	26.10	0.10
28.00	14.15	-13.95	28.10	0.10
30.00	15.20	-14.95	30.15	0.15
32.00	16.20	-15.95	32.15	0.15
34.00	17.20	-16.95	34.15	0.15
35.50	18.00	-17.70	35.70	0.20

The uncertainty of measurement was ± 0.11 inH₂O

* ΔP = High-port side - Low-port side

* 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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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
53/44 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG, BANGKOK 10250
TEL. 0-2717-3000-24 FAX. 0-2719-9484



Certificate of Calibration

Certificate No.: 24P1369
Page: 1 of 2

Equipment : Aneroid Barometer
Manufacturer: Barigo
Model : -
Serial No.: -
ID No.: UAE.ANV.013/2547

Condition As-Received: Used Item
Received Date: 05 April 2024
Calibration Date: 22 April 2024

Reference: 2404-0243WSC
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Atmospheric Pressure: 1007 mbar

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

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

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments Standard according to calibration procedure CP-P10, using " DKD-R 6-1 : Calibration of Pressure Gauges " 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.Scale and conversion factor is 1 kPa = 7.50062 mmHg				
5.This result of calibration instrument was in absolute pressure.				
6.This instrument was used clean air as pressure media.				
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 : Suksan Khankaew
Issue Date : 23 April 2024

Approved Signatory :
[] Phalinee Prapatsai
[] Sura Suwannasri
[✓] Attapol Panurach

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Cert.No.: 24P1369
Page: 2 of 2

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

Range: 720 mmHg to 780 mmHg
Scale Interval: 1 mmHg (The Fifth Estimate)

Applied Pressure (mmHg)	718.40	729.71	740.61	751.07	761.97	773.05	786.91
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	760.0	770.0	780.0
Error (mmHg)	1.60	0.29	-0.61	-1.07	-1.97	-3.05	-6.91

Decreasing Pressure	Applied Pressure (mmHg)	786.91	772.99	761.71	750.69	740.13	729.35	718.44
UUC* Indication (mmHg)	780.0	770.0	760.0	750.0	740.0	730.0	720.0	
Error (mmHg)		-6.91	-2.99	-1.71	-0.69	-0.13	0.65	1.56

The uncertainty of measurement was ± 0.24 mmHg

* 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 %.

-000-

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INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD HEAD OFFICE
7119 MOOT, SUBSISTENCE, 11 TAMBON, BANGKOK
AMPHOE RANG PHITSAMU (PRAKUN PROVINCE) 1046 THAILAND
TEL : 0899-2116-7960-1 FAX: 1609-2116-7146



Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING
Name : CONSULTANT CO.,LTD.
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
Prakong, Bangkok 10260
Certificate No : 24-TPM-319
Request No : Req-2024-1558
Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : Thermal Environment Monitor
Manufacturer : TSI QUEST
Model : QT-34
Serial Number : TEX040017
Resolution : 0.1 °C
ID Number : UAE.EFM.121/2566
Range Calibration : - 20 °C to 60 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 4.5
Calibration Position (mm) : 67.5
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 ± 3 °C
Humidity : 55 ± 15 %RH
Received Date : 10 July 2024
Calibrated Date : 16 July 2024
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard : Digital Thermometer with Sensor, Manufacturer: GINGO GINGO, Model: GT11-RTD100, SN: 08000057, ID: 02-TPM Which was calibrated on 1 March 2024, Calibration Certificate No.: QR24-0478

Traceability : This Certificate is traceable to SI Unit through Quality Refson Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0292

Note

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

Approved By :
Mr. Noppadon Luangtari
Technical Manager
Issue Date : 16 July 2024

The results stated only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the
110-706 (PM-11) Rev-01 Issue Date: 13-02-20

เอกสารไม่ควบคุม

Calibration Note

AUC Adjustment : Not Adjust

Certificate No : 24-TPM-319

Request No : Req-2024-1578

Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (°C)
WET	20.030	20.1	-0.1	0.13
	25.032	25.0	0.0	0.13
	30.034	30.0	0.0	0.13
	35.037	35.0	0.0	0.13
	40.039	40.0	0.0	0.13
	45.040	45.0	0.0	0.13
	50.043	50.0	0.0	0.13
	60.047	60.0	0.0	0.13
DRY	20.032	20.0	0.0	0.13
	25.033	25.0	0.0	0.13
	30.034	30.0	0.0	0.13
	35.036	35.0	0.0	0.13
	40.039	40.0	0.0	0.13
	45.040	45.0	0.0	0.13
	50.042	50.0	0.0	0.13
	60.044	60.0	0.0	0.13
GLOBE	20.030	20.0	0.0	0.13
	25.033	25.0	0.0	0.13
	30.035	30.0	0.0	0.13
	35.037	35.0	0.0	0.13
	40.038	40.0	0.0	0.13
	45.039	45.0	0.0	0.13
	50.042	50.0	0.0	0.13
	60.047	60.0	0.0	0.13

End of Certificate

Calibrated By :

Mr. Sittichok Jongsakornasul

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the calibration laboratory.

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Certificate of Calibration

Customer

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

Certificate No : 24-TPM-393

Request No : Req-2024-1949

Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature

Instrument Name : Thermal Environment Monitor
Manufacturer : TSI QUEST
Model : QT-32
Serial Number : TPT030008
Resolution : 0.1 °C
ID Number : UAEEFM2192562

Range Calibration : 20 °C to 60 °C

Type of Sensor : RTD

Sensor Diameter (mm) : 4.5

Calibration Position (mm) : 67.5

Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 3 °C

Humidity : 55 %RH ± 15 %RH

Received Date : 28 August 2024

Calibrated Date : 3 September 2024

Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometers

Reference Standard

Digital Thermometer with Sensor, Manufacturer: GINGO GINGO, Model: GT1U-RTD100, SN:

00000057, ID: 02-TPM Which was calibrated on 1 March 2024, Calibration Certificate No.: QR24-0478

Traceability

This Certificate is traceable to SI Unit through Quality Refson Co., Ltd., NSC-ONSC Accreditation No.:

Calibration 6292

Note

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

Approved By :

Mr. Noppadon Luangart

Technical Manager

Issue Date :

3 September 2024

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the calibration laboratory.

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เอกสารไม่ควบคุม

Calibration Note

AUC Adjustment : Not Adjust

Certificate No : 24-TPM-395

Request No : Req-2024-1949

Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (°C)
WET	20.031	20.0	0.0	0.13
	25.032	25.0	0.0	0.13
	30.034	30.0	0.0	0.13
	35.036	35.0	0.0	0.13
	40.039	40.0	0.0	0.13
	45.042	45.0	0.0	0.13
	50.042	50.0	0.0	0.13
	60.047	60.0	0.0	0.13
DRY	20.031	20.1	-0.1	0.13
	25.033	25.1	-0.1	0.13
	30.035	30.1	-0.1	0.13
	35.037	35.1	-0.1	0.13
	40.038	40.1	-0.1	0.13
	45.040	45.1	-0.1	0.13
	50.042	50.1	-0.1	0.13
	60.047	60.1	-0.1	0.13
GLOBE	20.030	20.0	0.0	0.13
	25.034	25.0	0.0	0.13
	30.036	30.0	0.0	0.13
	35.036	35.0	0.0	0.13
	40.038	40.0	0.0	0.13
	45.039	44.9	-0.1	0.13
	50.043	49.9	-0.1	0.13
	60.047	59.9	-0.1	0.13

End of Certificate

Calibrated By :

Mr. Sittichok Jongsakornasul

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the calibration laboratory.

เอกสารไม่ควบคุม

Certificate of Calibration

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

Certificate No : 24-TPM-396
Request No : Req-2024-1948
Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : Thermal Environment Monitor
Manufacturer : 3M
Model : QT-32
Serial Number : TPS030006
Resolution : 0.1 °C
ID Number : UAE.EFM.0812561

Range Calibration : 20 °C to 60 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 4.5
Calibration Position (mm) : 67.5
Instrument Status : Used

Calibration Environment and Details


Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 28 August 2024
Calibrated Date : 3 September 2024
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard : Digital Thermometer with Sensor, Manufacturer: GINGO/GINGO, Model: GT11/RTD100, SN: 08000657, ID: 02-TPM Which was calibrated on 1 March 2024, Calibration Certificate No. : QR24-0478

Traceability : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0292

Note

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

Approved By : 
Mr. Noppadol Luangart
Technical Manager
Issue Date : 3 September 2024

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.
FM-700-TPM-01 Rev.01 Issue Date: 13/02/20

Calibration No : 24-TPM-396
UUC Adjustment : Not Adjust
Certificate No : 24-TPM-396
Request No : Req-2024-1948
Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (°C)
WET	20.011	19.9	-0.1	0.13
	23.033	24.8	+0.2	0.13
	30.054	29.9	-0.1	0.13
	35.076	34.9	-0.1	0.13
	40.098	39.9	-0.1	0.13
	45.042	44.9	-0.1	0.13
DRY	50.042	49.9	-0.1	0.13
	60.047	59.9	-0.1	0.13
	20.011	19.9	-0.1	0.13
	23.033	24.9	+0.1	0.13
	30.075	29.9	-0.1	0.13
	35.077	34.9	-0.1	0.13
GLOBE	40.076	39.9	-0.1	0.13
	45.040	44.9	-0.1	0.13
	50.042	50.0	0.0	0.13
	60.047	60.0	0.0	0.13
	20.050	19.8	-0.1	0.13
	25.054	24.8	-0.1	0.13

End of Certificate

Calibrated By : 
Mr. Sittichok Jongsakulakul

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.
FM-700-TPM-01 Rev.01 Issue Date: 13/02/20

เอกสารไม่ควบคุม

Certificate of Calibration

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

Certificate No : 24-TPM-397
Request No : Req-2024-1947
Page : 1/2

Unit Under Calibration Details

Calibration Parameter : Temperature
Instrument Name : Thermal Environment Monitor
Manufacturer : 3M
Model : QT-32
Serial Number : TPS030004
Resolution : 0.1 °C
ID Number : UAE.EFM.0792561

Range Calibration : 20 °C to 60 °C
Type of Sensor : RTD
Sensor Diameter (mm) : 4.5
Calibration Position (mm) : 67.5
Instrument Status : Used

Calibration Environment and Details


Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 15 %RH
Received Date : 28 August 2024
Calibrated Date : 3 September 2024
Calibration Procedure : In-house method CP-TPM-01 by Comparison with Standard Thermometer.

Reference Standard : Digital Thermometer with Sensor, Manufacturer: GINGO/GINGO, Model: GT11/RTD100, SN: 08000657, ID: 02-TPM Which was calibrated on 1 March 2024, Calibration Certificate No. : QR24-0478

Traceability : This Certificate is traceable to SI Unit through Quality Reborn Co., Ltd., NSC-ONSC Accreditation No.: Calibration 0292

Note

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

Approved By : 
Mr. Noppadol Luangart
Technical Manager
Issue Date : 3 September 2024

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.
FM-700-TPM-01 Rev.01 Issue Date: 13/02/20

Calibration No : 24-TPM-397
UUC Adjustment : Not Adjust
Certificate No : 24-TPM-397
Request No : Req-2024-1947
Page : 2/2

Result of Calibration :

UUC Sensor	Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (°C)
WET	20.011	19.8	-0.2	0.13
	23.033	24.8	+0.2	0.13
	30.054	29.9	-0.1	0.13
	35.076	34.9	-0.1	0.13
	40.098	39.9	-0.1	0.13
	45.042	44.9	-0.1	0.13
DRY	50.042	49.9	-0.1	0.13
	60.047	59.9	-0.1	0.13
	20.011	19.9	-0.1	0.13
	23.033	24.9	+0.1	0.13
	30.075	29.9	-0.1	0.13
	35.077	34.9	-0.1	0.13
GLOBE	40.076	39.8	-0.2	0.13
	45.040	44.8	-0.2	0.13
	50.042	49.8	-0.2	0.13
	60.047	59.8	-0.2	0.13
	20.050	19.8	-0.2	0.13
	25.054	24.8	-0.2	0.13

End of Certificate

Calibrated By : 
Mr. Sittichok Jongsakulakul

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.
FM-700-TPM-01 Rev.01 Issue Date: 13/02/20

เอกสารไม่ควบคุม

MULTI-POINT GAS TEST REPORT

Test Date : Sep 9, 2024

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo Scientific Serial Number : 1201778117

Standard Gas Concentration

Sulphur Dioxide (SO ₂)	42.89	PPM
Nitric Oxide (NO)	46.77	PPM
Methane (CH ₄)	-	PPM
Carbon Monoxide (CO)	965.9	PPM
Cylinder No. :	EB01159156	
Expiration Date :	Nov 06, 2026	

Dilutor Detail

Manufacturer :	Thermo Scientific
Model :	146i
Serial Number :	1180540071

Multi-point gas test data

Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.0	0.0	0.0
Level 2 20.00%	10.0	10.5	0.5	4.8
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
:Acceptable Limit $\pm 5\%$

Multi-Point Gas Test Chart

Calculate by : *Sithiporn C.*
9 / 9 / 2567

Approve by : *Sithiporn C.*
9 / 9 / 2567

MULTI-POINT GAS TEST REPORT

Test Date : Dec 12, 2024

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778118

Standard Gas Concentration

Sulphur Dioxide (SO ₂)	42.89	PPM
Nitric Oxide (NO)	46.77	PPM
Methane (CH ₄)	-	PPM
Carbon Monoxide (CO)	965.9	PPM
Cylinder No. :	EB01159156	
Expiration Date :	Nov 06, 2026	

Dilutor Detail

Manufacturer :	Thermo Scientific
Model :	146i
Serial Number :	1180540071

Multi-point gas test data

Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.0	0.0	0.0
Level 2 20.00%	10.0	10.6	0.6	5.7
Level 3 40.00%	20.0	20.7	0.7	3.4
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
:Acceptable Limit $\pm 5\%$

Multi-Point Gas Test Chart

Calculate by : *Sithiporn C.*
12 / 12 / 2567

Approve by : *Sithiporn C.*
12 / 12 / 2567

MULTI-POINT GAS TEST REPORT

Test Date : Dec 6, 2024

Equipment : Gas Analyzer (CO) Model : 48i
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201778119

Standard Gas Concentration

Sulphur Dioxide (SO ₂)	42.89	PPM
Nitric Oxide (NO)	46.77	PPM
Methane (CH ₄)	-	PPM
Carbon Monoxide (CO)	965.9	PPM
Cylinder No. :	EB01159156	
Expiration Date :	Nov 06, 2026	

Dilutor Detail

Manufacturer :	Thermo Scientific
Model :	146i
Serial Number :	1180540071

Multi-point gas test data

Reference Value (ppm)	Analyzer Display (ppm)	Difference Error	Percent Error	[% Error]
Level 1 Zero	0.0	0.0	0.0	0.0
Level 2 20.00%	10.0	10.7	0.7	6.5
Level 3 40.00%	20.0	20.4	0.4	2.0
Level 4 60.00%	30.0	30.7	0.7	2.3
Level 5 80.00%	40.0	40.0	0.0	0.0

Remark : Measuring Range 50.0 ppm
:Acceptable Limit $\pm 5\%$

Multi-Point Gas Test Chart

Calculate by : *Sithiporn C.*
6 / 12 / 2567

Approve by : *Sithiporn C.*
6 / Dec / 2024

Cert. No. : ACL24274
Pages : 1 of 9

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-43 / Microphone UC-52 / Preamplifier NH-24
Serial No. : 00430294 / 202717 / 28144
ID No. : UAE.EFM.1572566

Condition As Found : GOOD

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT (UAE)
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK SUB-DISTRICT,
PHRAKHAONG DISTRICT, BANGKOK 10260
THAILAND.

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

Received Date : 02 SEPTEMBER 2024
Calibration Date : 12 -17 SEPTEMBER 2024
Date of Issue : 19 SEPTEMBER 2024

Calibrated by : Nathakorn Pisutpaisan

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

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

SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbunru, Bangkok, 10700 Thailand
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24274
Job No. : VC67AC0136
Pages : 2 of 9

Calibration Procedure : CP-AC-02

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EELBP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EELBP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EELBP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAJ	34560495	AA-3001-24	05-FEB-25

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

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

3.1 National Institute of Metrology (Thailand).

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

SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbunru, Bangkok, 10700 Thailand
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24274
Job No. : VC67AC0136
Pages : 3 of 9

Summary of Measurement Result :

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

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbunru, Bangkok, 10700 Thailand
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24274
Job No. : VC67AC0136
Page : 4 of 9

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.9

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

Frequency Weighting	Weighting (dB)
A - weight	13.8
C - weight	18.9
Flat	24.7

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
125	0.1	0.1	0.1	±1.5
1000	0.0	0.0	0.0	±1.0
8000	-1.1	-1.1	-1.1	±5.0

SITHIPORN ASSOCIATES CO., LTD. CALIBRATION LABORATORY

451-451/1 Sirinthorn Road, Bangbunru, Bangkok, 10700 Thailand
Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24274
Job No. : VC67AC0136
Pages : 5 of 9

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Flat	C-weight	A-weight	Acceptance Limits
63	0.0	0.0	0.0	±2.0
125	0.0	0.0	-0.1	±1.5
250	0.0	0.0	-0.1	±1.5
500	0.0	0.0	-0.1	±1.5
1000	0.0	0.0	0.0	±1.0
2000	0.0	0.0	0.0	±2.0
4000	0.0	0.0	0.0	±3.0
8000	-0.1	-0.1	-0.1	±5.0

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	±0.2

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

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Cert. No. : ACL24274
Job No. : VC67AC0136
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7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.8	-0.2	± 1.1
26.0	25.9	-0.1	± 1.1
25.0	24.8	-0.2	± 1.1

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Cert. No. : ACL24274
Job No. : VC67AC0136
Pages : 7 of 9

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.6	29.6	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

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Cert. No. : ACL24274
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10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.0	-0.4	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±2.0
Positive half cycle	132.4	132.2	-0.2	±2.0
Negative half cycle	132.4	132.2	-0.2	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.5	0.0	±1.5

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Cert. No. : ACL24274
Job No. : VC67AC0136
Pages : 9 of 9

12. High level stability

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

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

End of Calibration Certificate

เอกสารไม่ควบคุม

Cert. No. : ACL24275
Pages : 1 of 9

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RJON
Model : NL-43 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00430295 / 202718 / 28145
ID No.: UAE.EFM.158/2566

Condition As Found : GOOD

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT (UAE)
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK SUB-DISTRICT,
PHRAKHANONG DISTRICT, BANGKOK 10260
THAILAND.

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

Received Date : 02 SEPTEMBER 2024
Calibration Date : 12-17 SEPTEMBER 2024
Date of Issue : 19 SEPTEMBER 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchurai)

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

เอกสารไม่ควบคุม

Cert. No. : ACL24275
Job No. : VC67AC0136
Pages : 2 of 9

Calibration Procedure : CP-AC-02

Calibration Method :

This equipment was calibrated by follow on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21.0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20.0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22.0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KAI	34560495	AA-3001-24	05-FEB-25

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

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

3.1 National Institute of Metrology (Thailand).

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

เอกสารไม่ควบคุม

Cert. No. : ACL24275
Job No. : VC67AC0136
Pages : 3 of 9

Summary of Measurement Result :

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

เอกสารไม่ควบคุม

Cert. No. : ACL24275
Job No. : VC67AC0136
Page : 4 of 9

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	± 0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.1

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

Frequency Weighting (dB)	Weighting (dB)
A - weight	12.5
C - weight	18.6
Flat	24.6

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.3	0.3	0.3	± 1.5
1000	0.0	0.0	0.0	± 1.0
8000	-1.1	-1.1	-1.1	± 5.0

เอกสารไม่ควบคุม

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.2

เอกสารไม่ควบคุม

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	43.9	-0.1	± 1.1
39.0	38.9	-0.1	± 1.1
34.0	33.9	-0.1	± 1.1
29.0	28.9	-0.1	± 1.1
28.0	27.9	-0.1	± 1.1
27.0	26.8	-0.2	± 1.1
26.0	25.8	-0.2	± 1.1
25.0	24.8	-0.2	± 1.1

เอกสารไม่ควบคุม

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.6	29.6	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	108.0	0.0	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
SEL	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

เอกสารไม่ควบคุม

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L _{peak} (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.0	-0.4	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±2.0
Positive half cycle	132.4	132.1	-0.3	±2.0
Negative half cycle	132.4	132.1	-0.3	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.6	89.5	-0.1	±1.5

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Cert. No. : ACL24275
Job No. : VC67AC0136
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12. High level stability

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

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

End of Calibration Certificate

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SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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Tel: +66 2433 8331 Email: calibration@sithiporn.com



Cert. No. : ACL24311
Pages : 1 of 9

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-43 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00730428 / 204876 / 32841
ID No.: UAE-EFM.171/2566

Condition As Found : GOOD

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT (UAE)
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK SUB-DISTRICT,
PHRAKHANONG DISTRICT, BANGKOK 10260
THAILAND.

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

Received Date : 16 SEPTEMBER 2024
Calibration Date : 09 -10 OCTOBER 2024
Date of Issue : 11 OCTOBER 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchurai
(Thanakul Petchurai)

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Cert. No. : ACL24311
Job No. : VC67AC0147
Pages : 2 of 9

Calibration Procedure : CP-AC-02

Calibration Method :

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

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL_BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL_BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL_BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KA1	34560495	AA-3001-24	05-FEB-25

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

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

3.1 National Institute of Metrology (Thailand).

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

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Cert. No. : ACL24311
Job No. : VC67AC0147
Pages : 3 of 9

Summary of Measurement Result :

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

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Cert. No. : ACL24311
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Page : 4 of 9

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.7

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

Frequency Weighting	Weighting (dB)
A - weight	13.2
C - weight	18.3
Flat	24.2

3. Acoustical signal tests of frequency weightings

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

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

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Cert. No. : ACL24311
Job No. : VC67AC0147
Pages : 5 of 9

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.1	0.1	เอกสารไม่ควบคุม

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Cert. No. : ACL24311
Job No. : VC67AC0147
Pages : 6 of 9

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	136.9	-0.1	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	128.9	-0.1	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.1	0.1	± 1.1
29.0	29.0	0.0	± 1.1
28.0	28.1	0.1	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.1	0.1	± 1.1

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8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.0	0.0	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.0	0.0	±1.0

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10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lpeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.3	-0.1	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	±2.0
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	Value (dB)	(dB)
89.6	89.6		
		0.0	±1.5

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Job No. : VC67AC0147
Pages : 9 of 9

12. High level stability

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

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

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Cert. No. : ACL24315
Pages : 1 of 9

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RJON
Model : NL-43 / Microphone UC-52 / Preamplifier NH-24
Serial No.: 00730433 / 204881 / 32846
ID No.: UAEEFM176/2566

Condition As Found : GOOD

Customer : UNITED ANALYST AND ENGINEERING CONSULTANT (UAE)
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,
BANGCHAK SUB-DISTRICT,
PHRAKHANONG DISTRICT, BANGKOK 10260
THAILAND.

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

Received Date : 16 SEPTEMBER 2024
Calibration Date : 09-10 OCTOBER 2024
Date of Issue : 11 OCTOBER 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by :

T. Petchur
(Thanakul Petchurai)

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

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Calibration Procedure : CP-AC-02

Calibration Method :

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

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-24	05-FEB-25
Waveform Generator	33511B	MY52302742	EF-0007-24	05-FEB-25
Digital Multimeter	33461A	MY53220104	EEL-BP 21/0267	13-FEB-25
Digital Multimeter	33461A	MY53220076	EEL-BP 20/0267	15-FEB-25
Digital Multimeter	34461A	MY60024273	EEL-BP 22/0267	15-FEB-25
Programmable Attenuator	MAT-1070	62100114	EF-0008-24	05-FEB-25
Condenser Microphone	4180	2977900	AA-1001-24	12-FEB-25
Measuring Amplifier	NA-42KA1	34560495	AA-3001-24	05-FEB-25

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

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

3.1 National Institute of Metrology (Thailand).

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

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Summary of Measurement Result :

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

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Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.94)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
15.8

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

Frequency Weighting	Weighting (dB)
A - weight	13.4
C - weight	18.7
Flat	24.4

3. Acoustical signal tests of frequency weightings

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

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)			
	Flat	C-weight	A-weight	Acceptance Limits
125	0.4	0.5	0.5	± 1.5
1000	0.2	0.2	0.2	± 1.0
8000	-0.6	-0.6	-0.6	± 5.0

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4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

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

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

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

5.2 Time weighting at 1 kHz

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

6. Long - term stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	94.0	94.0	0.0	± 0.1

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Job No. : VC67AC0147
Pages : 6 of 9

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
137.0	137.0	0.0	± 1.1
136.0	136.0	0.0	± 1.1
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1
34.0	34.0	0.0	± 1.1
30.0	30.0	0.0	± 1.1
29.0	29.1	0.1	± 1.1
28.0	28.1	0.1	± 1.1
27.0	27.1	0.1	± 1.1
26.0	26.1	0.1	± 1.1
25.0	25.2	0.2	± 1.1

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8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	94.0	94.0	0.0	±1.1

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	29.0	29.0	0.0	±1.1

9. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.9	-0.1	1.5 ; -5.0
	2	8	117.0	117.0	0.0	1.0 ; -2.5
	200	800	134.0	134.1	0.1	±1.0
Slow	2	8	108.0	108.0	0.0	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	99.0	98.9	-0.1	1.5 ; -5.0
SEL	2	8	108.0	108.0	0.0	1.0 ; -2.5
	200	800	128.0	128.1	0.1	±1.0

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Pages : 8 of 9

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, Lepeak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	130.0	130.0	0.0	±3.0
One	133.4	133.4	0.0	±3.0

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

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle		
89.5	89.5	0.0	±1.5

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12. High level stability

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

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

End of Calibration Certificate

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Accredited calibration laboratory
ISO/IEC 17025:2017
NSC-TIS-TIS 17025
CALIBRATION 0367
Flow measurement laboratory
Calibration services department



CERTIFICATE OF CALIBRATION

Page 1 of 2 Pages

Certificate No. : COK-039-07

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

Top Load Orifice
TOSCI
TE-6025A
9363
UAE ETM 063/2560
Used Item
United Analytic and Engineering Consultant Co., Ltd.
81 Soi Udonmuk 41, Sukhumvit Road, Bangkok, Phrakhamong,
Bangkok 10260

RECEIVED DATE
MEASUREMENT DATE
ISSUE DATE

16 Sep 2024
27 Sep 2024
27 Sep 2024

ENVIRONMENTAL CONDITIONS:

Ambient condition in the laboratory are as follow:
Temperature : 23.0 ± 3.0 °C
Relative Humidity : 55.0 ± 15.0 %RH
Atmospheric Pressure : 1050 ± 50 hPa

CALIBRATION CONDITION:

Preconditioning : 24 hours at ambient conditions
Measurement Condition : The average values during measurement are 23.9 °C and 49.0 %RH

NOTES: 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.

Collegated by
☐ Mr. Sorgrat Thichaiad
IT Manager/Department Leader



Approved signature
Mr. Parinya Booncharoen
Calibration Department Manager

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MEASUREMENT RESULTS:

The Oriflux gas flow device was calibrated by direct comparison method with the Standard Rotary Displacement Meter (Rods Meter). The humid air was used as a medium in the system. The standard conditions are 25°C (78.15 °F) and 760 mmHg for standard temperature and standard pressure respectively.

Table 1: The results of (g) Standard calibration data

Rate	Flow rate m ³ /min	Pressure (Pa) mmHg	Temperature (T _g) °C	Temperature (T _m) °C	A _g _meter mmHg	A _g _Oriflux mmHg	Y	Standard Flow (Q _s) m ³ /min
1	0.703	758.131	23.32	22.49	56.556	1.738	1.819	0.654
2	1.000	758.205	23.20	22.83	63.034	1.473	1.805	0.922
3	1.121	758.284	23.64	22.69	42.633	1.842	2.357	1.064
4	1.167	758.274	23.64	22.65	31.359	5.197	2.282	1.125
5	1.409	758.325	24.00	23.14	30.402	7.654	2.768	1.338

Slope (a): 2.05577
Intercept (b): -0.02807
Correlation coefficient (r): 0.99985
Uncertainty (k=2): 0.015 m³/min

Table 2: The results of (g) actual calibration data

Rate	Flow rate m ³ /min	Pressure (Pa) mmHg	Temperature (T _g) °C	Temperature (T _m) °C	A _g _meter mmHg	A _g _Oriflux mmHg	Y	Standard Flow (Q _s) m ³ /min
1	0.703	758.131	23.32	22.49	56.556	1.738	0.825	0.653
2	1.000	758.205	23.20	22.83	63.034	1.473	1.166	0.920
3	1.121	758.284	23.64	22.69	42.633	1.842	1.568	1.061
4	1.167	758.274	23.64	22.65	31.359	5.197	1.426	1.123
5	1.409	758.325	24.00	23.14	30.402	7.654	1.782	1.337

Slope (a): 1.38763
Intercept (b): -0.01756
Correlation coefficient (r): 0.99985
Uncertainty (k=2): 0.015 m³/min

End of Certificate of Calibration



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Certificate No.: CP20240287EA
Operation No.: CP2024070250

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRLxT1 (Preamplifier)
Serial No.: 0007309 (Meter), 345239 (Microphone), 077644 (Preamplifier)
ID No.: UAE.EFM.041/2566
Customer: United Analyst and Engineering Consultant Co.,Ltd.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak Phrakhanong, Bangkok 10260
Received Date: 25 July 2024
Calibrated Date: 2 - 5 August 2024
Issued Date: 7 August 2024
Calibrated by: Ms. Juntaporn Kurnhakom

Approved by: 
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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F-CAL-004 Ed.1

Certificate No.: CP20240287EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRLxT1 (Preamplifier)
Serial No.: 0007309 (Meter), 345239 (Microphone), 077644 (Preamplifier)
ID No.: UAE.EFM.041/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa
Method of Calibration :-
IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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

- Reference standards instrument for Acoustic function
 - National Institute of Metrology (Thailand)
- Reference standards instrument for Electrical function
 - National Institute of Metrology (Thailand)
 - Electrical and Electronics Institute; NSC Accredited Calibration No.01119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

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Certificate No.: CP20240287EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
30.5

2.2 Microphone replaced by the electrical input signal device

Frequency	Measured value
Weighting	(dB)
A-weighting	29.5
C-weighting	29.5
Z-weighting	35.5

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)
Meter free-field acoustic response at a level of 84 dB.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.4	0.3	0.4	±1.0
1000	0.1	0.1	0.1	±0.7
8000	-1.6	-1.6	-1.6	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve			
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	0.0	0.0	±1.0
125	0.0	0.0	-0.1	±1.0
250	0.0	0.0	-0.1	±1.0
500	0.0	0.0	-0.1	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	-0.1	±1.0
4000	0.0	0.0	-0.1	±1.0
8000	-0.1	-0.1	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

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Certificate No.: CP20240287EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8
140.0	140.0	0.0	±0.8

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Certificate No.: CP20240287EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.9	-0.1	+1.0 ; -1.5
	0.25	109.8	-0.2	+1.0 ; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.9	-0.1	+1.0 ; -3.0
	200	130.0	0.0	±0.5
LAE	2	110.1	0.1	+1.0 ; -1.5
	0.25	101.0	0.0	+1.0 ; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.0	-0.4	±1.0

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Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
144.3	144.2	-0.1	±1.5

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

Remarks: 1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
2. The acceptance limit is for the deviated value.
3. Acceptance limits was IEC61672-3:2013 Class 1.
4. The coverage factor $k = 2.00$

-- End of Report --

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Certificate No.: CP20240288EA

Operation No.: CP2024070251

Certificate of Calibration

Equipment: Sound Level Meter

Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)

Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)

Serial No.: 0007312 (Meter), 345818 (Microphone), 077647 (Preamplifier)

ID No.: UAE.EFM.044/2566

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

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

Received Date: 25 July 2024

Calibrated Date: 5 - 6 August 2024

Issued Date: 7 August 2024

Calibrated by: Ms. Juntaporn Kunhakom

Approved by: 
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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Certificate No.: CP20240288EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRLxT1 (Preamplifier)
Serial No.: 0007312 (Meter), 345818 (Microphone), 076747 (Preamplifier)
ID No.: UAE.EFM.044/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa

Method of Calibration :-

IEC 61672-3:2013.

Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PA5	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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

Reference standards instrument for Acoustic function
- National Institute of Metrology (Thailand)

Reference standards instrument for Electrical function

- National Institute of Metrology (Thailand)

- Electrical and Electronics Institute; NSC Accredited Calibration No.0119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

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Certificate No.: CP20240288EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone installed

Measured value (dB)
28.5

2.2 Microphone replaced by the electrical input signal device

Frequency Weighting	Measured value (dB)
A-weighting	28.4
C-weighting	28.3
Z-weighting	34.1

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
125	0.2	0.1	0.1	±1.0
1000	0.0	0.0	0.0	±0.7
8000	-0.9	-0.9	-0.8	+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)	Acceptance limits (dB)
63	0.0	0.1	0.0	±1.0
125	0.0	0.0	0.0	±1.0
250	0.0	0.0	0.0	±1.0
500	0.0	-0.1	0.0	±1.0
1000	0.0	0.0	0.0	±0.7
2000	0.0	0.0	0.0	±1.0
4000	0.0	0.0	0.0	±1.0
8000	-0.1	0.0	0.0	+1.5; -2.5
16000	0.0	0.0	-0.1	+2.5; -16.0

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Certificate No.: CP20240288EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8

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Certificate No.: CP20240288EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.1	0.1	±0.8
39.0	39.3	0.3	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	136.0	0.0	±0.5
	2	118.8	-0.2	+1.0; -1.5
Slow	0.25	109.7	-0.3	+1.0; -3.0
	200	129.5	-0.1	±0.5
LAE	2	109.9	-0.1	+1.0; -3.0
	200	130.0	0.0	±0.5
	0.25	110.0	0.0	+1.0; -1.5
		100.9	-0.1	+1.0; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.0	-0.4	±1.0

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FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240288EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
142.4	142.3	-0.1	±1.5

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

Remarks: 1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
2. The acceptance limit is for the deviated value.
3. Acceptance limits was IEC61672-3:2013 Class 1.
4. The coverage factor $k = 2.00$

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Phraek Sa, Mueang Samut Prakan, Samut Prakan 10280
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Certificate No.: CP20240289EA
Operation No.: CP2024070252

Certificate of Calibration

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)
Serial No.: 0007310 (Meter), 345240 (Microphone), 077645 (Preamplifier)
ID No.: UAE.EFM.042/2566
Customer: United Analyst and Engineering Consultant Co.,Ltd.
Address: 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak
Phrakhanong, Bangkok 10260
Received Date: 25 July 2024
Calibrated Date: 5 - 6 August 2024
Issued Date: 7 August 2024
Calibrated by: Ms. Juntaporn Kunhakom

Approved by: 
(Mr. Sittichai Swaksuriyawong)
Group Manager

This report was prepared electronically using applicable electronic signature. Printing or copy of file are considered as a copy of the document.

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor (k) providing a level of confidence of approximately 95%. This certificate may not be reproduced other than in full except with the prior written approval of the Electrical and Electronics Institute, Foundation for Industrial Development.

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FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240289EA

Calibration Report

Equipment: Sound Level Meter
Manufacturer: Larson Davis (Meter), PCB (Microphone), PCB (Preamplifier)
Model/Type: LxT1 (Meter), 377B02 (Microphone), PRMLxT1 (Preamplifier)
Serial No.: 0007310 (Meter), 345240 (Microphone), 077645 (Preamplifier)
ID No.: UAE.EFM.042/2566
Ambient Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 15) %
Pressure: (101.3 ± 1.5) kPa
Method of Calibration :-
IEC 61672-3:2013.
Condition of this result of calibration

1. Reference standards instrument :-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Standard microphone	4180	2787490	AA-1012-23	12 November 2024
2) Arbitrary Function Generator	AFG2021	C010063	CK20240048EA	23 June 2025
3) Programmable Attenuator	PAS	2755	EF-0040-23	1 October 2024
4) 6.5 Digit precision multimeter	8846A	9610014	CB20230200EA	15 November 2024
5) Pressure humidity and Temperature Transmitter	PTU301	L3950483	CL1-P240023 CD20240142EA	24 March 2025 12 June 2025
6) Pressure humidity and Temperature Transmitter	PTU301	L3950484	CL1-P240030 CD20240143EA	11 April 2025 12 June 2025
7) Performance Audio Analyzer	U8903B	MY56510003	CB20240035EB CK20230072EA	13 February 2025 13 September 2024

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

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

- Reference standards instrument for Acoustic function
 - National Institute of Metrology (Thailand)
- Reference standards instrument for Electrical function
 - National Institute of Metrology (Thailand)
 - Electrical and Electronics Institute; NSC Accredited Calibration No.01119

Result of Calibration:-

Function : 1. Indication at the calibration check frequency

Reference Acoustic Signal (dB)	Measured value (dB)	Deviation (dB)	Acceptance limits (dB)
-	-	-	-

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ELECTRICAL AND ELECTRONICS INSTITUTE
FOUNDATION FOR INDUSTRIAL DEVELOPMENT

Certificate No.: CP20240289EA

Calibration Report

Function : 2. Self-generated Noise

2.1 Microphone Installed

Measured value (dB)
30.3

2.2 Microphone replaced by the electrical input signal device

Frequency	Measured value (dB)
A-weighting	30.1
C-weighting	30.0
Z-weighting	35.7

Function : 3. Acoustical signal tests of frequency weightings (Without Windscreen)

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

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve				Acceptance limits (dB)
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)		
125	0.3	0.2	0.3		±1.0
1000	0.2	0.2	0.2		±0.7
8000	-0.2	-0.1	-0.1		+1.5; -2.5

Function : 4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency (Hz)	Deviation from various Frequency Weighting Response Curve				Acceptance limits (dB)
	C-Weighting (dB)	A-Weighting (dB)	Z-Weighting (dB)		
63	-0.1	0.1	0.0		±1.0
125	0.0	0.0	0.0		±1.0
250	0.0	0.0	0.0		±1.0
500	0.0	0.0	0.0		±1.0
1000	0.0	0.0	0.0		±0.7
2000	0.0	0.1	0.0		±1.0
4000	0.0	0.0	0.0		±1.0
8000	-0.1	0.0	0.0		+1.5; -2.5
16000	0.0	0.0	-0.1		+2.5; -16.0

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Certificate No.: CP20240289EA

Calibration Report

Function : 5. Frequency and time weighting at 1 kHz

5.1 Frequency weighting at 1 kHz

Frequency Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
C-weighting	94.0	0.0	±0.2
A-weighting	94.0	0.0	±0.2
Z-weighting	94.0	0.0	±0.2

5.2 Time weighting at 1 kHz

Time Weighting	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	94.0	0.0	±0.1
Slow	94.0	0.0	±0.1
LAeq	94.0	0.0	±0.1

Function : 6. Long-Term Stability

Long-term stability over 30 minutes, with steady 1 kHz signal at reference level.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
30	94.0	94.0	0.0	±0.1

Function : 7. Level Linearity on the reference level range

7.1 Level Linearity on the reference level range, Upper

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
99.0	99.0	0.0	±0.8
104.0	104.0	0.0	±0.8
109.0	109.0	0.0	±0.8
114.0	114.0	0.0	±0.8
119.0	119.0	0.0	±0.8
124.0	124.0	0.0	±0.8
129.0	129.0	0.0	±0.8
134.0	134.0	0.0	±0.8
139.0	139.0	0.0	±0.8
140.0	140.0	0.0	±0.8
141.0	141.0	0.0	±0.8

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Certificate No.: CP20240289EA

Calibration Report

7.2 Level Linearity on the reference level range, Lower

Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
94.0	94.0	0.0	±0.8
89.0	89.0	0.0	±0.8
84.0	84.0	0.0	±0.8
79.0	79.0	0.0	±0.8
74.0	74.0	0.0	±0.8
69.0	69.0	0.0	±0.8
64.0	64.0	0.0	±0.8
59.0	59.0	0.0	±0.8
54.0	54.0	0.0	±0.8
49.0	49.0	0.0	±0.8
44.0	44.1	0.1	±0.8
39.0	39.4	0.4	±0.8

Function : 8. Tone burst response

Time Weighting	Tone burst duration, Tb (ms)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Fast	200	135.9	-0.1	±0.5
	2	118.8	-0.2	+1.0 ; -1.5
	0.25	109.8	-0.2	+1.0 ; -3.0
Slow	200	129.5	-0.1	±0.5
	2	109.9	-0.1	+1.0 ; -3.0
	200	130.0	0.0	±0.5
LAE	2	110.0	0.0	+1.0 ; -1.5
	0.25	100.9	-0.1	+1.0 ; -3.0

Function : 9. Peak C sound level

Number of cycles in test signal	Anticipated Value (dB)	Measured value (dB)	Deviated value (dB)	Acceptance limits (dB)
Complete cycle	135.4	134.8	-0.6	±2.0
Positive half cycle	134.4	134.0	-0.4	±1.0
Negative half cycle	134.4	134.0	-0.4	±1.0

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F-CAL-005 Ed.1



Certificate No.: CP20240289EA

Calibration Report

Function : 10. Overload indication

Measured value (dB)		Deviated value (dB)	Acceptance limits (dB)
Positive one-half cycle	Negative one-half cycle		
144.3	144.2	-0.1	±1.5

Function : 11. High-Level Stability

High-level stability over 5 minutes, with steady 1 kHz signal, 1 dB below upper boundary.

Time Period to Apply Signal (min)	Reference SPL (dB)	Record SPL at Conclusion of Time Period (dB)	Deviated value (dB)	Acceptance limits (dB)
5	139.0	139.0	0.0	±0.1

Uncertainty of measurement

Function	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1) Indication at the calibration check frequency	0.30	Not applicable
2) Self-generated Noise	0.10	Not applicable
3) Acoustical signal tests of frequency weightings - Free-field sound pressure response level	0.30	0.60 (10Hz to 4kHz) 0.70 (>4kHz to 10kHz)
4) Electrical signal tests of frequency weightings	0.20	0.20
5) Frequency and time weighting at 1 kHz	0.20	0.20
6) Long-Term Stability	0.10	0.10
7) Level Linearity on the reference level range	0.30	0.30
8) Tone burst response	0.20	0.30
9) Peak C sound level	0.20	0.35
10) Overload indication	0.20	0.25
11) High-Level Stability	0.10	0.10

Remarks: 1. Indication at the calibration check frequency can not measured because customer does not provide a sound calibrator.
2. The acceptance limit is for the deviated value.
3. Acceptance limits was IEC61672-3:2013 Class 1.
4. The coverage factor $k = 2.00$

-- End of Report --

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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 FAX. 0-2719-9484

Certificate of Testing

Cert.No.: 24TW200
Page.: 1 of 2

Equipment : DO Meter
Manufacturer : Horiba
Model : LAQUA-DO210
Serial No. : HE1D0010
ID No. : UAE.EFM.208/2564(EFM.DO.10/64)
Received Date : 17 September 2024
Test Date : 18 September 2024
Reference : 2409-0633WSC-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
() Unnopphol Harachai
() Ponpan Paipim
(✓) Saitthip Meangmai
Issue Date : 18 September 2024

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Cert.No.: 24TW200
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	24MM131	04 July 2025

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.6%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 9K1B0023

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.18	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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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



Certificate of Calibration

Cert. No.: 24LM150
Page.: 1 of 2

Equipment : DO Meter with Sensor
Manufacturer : Horiba
Model : LAQUA-DO210
Serial No. : HE1D0010
ID No. : UAE.EFM.208/2564(EFM.DO.10/64)
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260
Location : TPA On Site Calibration Laboratory
Received Order : 17 September 2024
Calibrated Date : 18 September 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Warakorn Lemgagrakul
Approved by :
Approved Signatory
() Ponpan Paipim
() Suwit Imjai
(✓) Kunchit Promprat
Issue Date : 21 September 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.

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Equipment : DO Meter with Sensor
Condition As-Received : Used Item
Reference : 2409-0633WSC-2
Procedure Used :-

Cert. No.: 24LM150
Page.: 2 of 2

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.
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) Digital Thermometer	2188080	2311216	TPA	11 Oct 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 : Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 9K1B0023

Calibration Point (°C)	Immersion Depth (mm)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty (± °C)	Coverage Factor k
25.0	80	25.002	25.0	-0.002	0.16	2.00
30.0	80	30.003	30.0	-0.003	0.16	2.00
35.0	80	35.004	35.0	-0.004	0.16	2.00

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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Envi Equipment Service Co., Ltd.
110/254 Moo 3, Tambon Bang Rak Phuthana, Amphur Bang Bua Thong, Nonthaburi 11110
Tel. 098 362 9152, 089 478 7885
E-mail: sales@envi-ers.com

Certificate No.: E24-070051
Page.: 1 of 6

CERTIFICATE OF CALIBRATION

Customer : United Analyst and Engineering Consultant Co., Ltd.
Address : 81 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Description of Equipment : Console meter
Manufacturer : Apex Instrument
Model Number : XC-S72-V
Serial Number : 1904013
ID./Control No. : UAE.EFM. 120/2562
Environment Conditions : Temperature (25 ± 2) °C
Humidity (50 ± 15) % RH
Cal. Date : 09/07/2024
Issue Date : 09/07/2024

Calibration Method or Calibration Procedure Used

US EPA Method (United State Environmental Protection Agency)

This certificate is traceable to national standard, which refers the units of measurement according to the International System of Units (SI).

Result of Calibration

This certificate may not be reproduced other than in full except with prior written approval of the Technical Manager, Envi Equipment Service Company Limited.

These reported uncertainties of measurement are expanded by a coverage factor of *k*=2, providing a 95% confidence level

Calibrated by : Mr. Sanyu Sangnil

Approved by :

(Mr. Mana Fuekha)

Technical Manager

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METHOD 5 CONSOLE CALIBRATION
USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425
5-POINT METRIC UNIT

Meter Console Information		Calibration Conditions				Factors/Conversions		
Console Model Number	XC-572-V	Date	Time	09/07/2024	02:10 PM	Std Temp	293	K
Console Serial Number	1904013	Calibration Reference No.	SER24-070022			Std Press	760	mm Hg
DGM Model Number	SK25EX	Barometric Pressure	755.16			K _i	0.386	
DGM Serial Number	00004106	Calibration Meter Gamma	1.001			Console Leak Check	PASS	

Calibration Data										
Metering Console					Calibration Meter					
Run Time	DGM Orifice DH	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	Volume Initial	Volume Final	Outlet Temp Initial	Outlet Temp Final	
Elapsed (Q)	(P _o)	(V _{in})	(V _{out})	(t _{in})	(t _{out})	(V _{wi})	(V _{wf})	(t _{in})	(t _{out})	
min.	mm H ₂ O	m ³	m ³	°C	°C	m ³	m ³	°C	°C	
12.28	13.0	1431.461	1431.601	33	33	229.90296	229.04402	27	27	
12.30	13.0	1431.601	1431.741	32	32	229.04402	229.18536	27	27	
8.68	26.8	1431.748	1431.888	32	32	229.19244	229.33414	27	27	
8.70	26.8	1431.888	1432.028	32	32	229.33414	229.47544	27	27	
14.08	40.0	1432.036	1432.316	32	32	229.48350	229.76544	26	26	
14.02	40.0	1432.316	1432.596	33	33	229.76544	230.04602	26	26	
10.40	70.0	1432.608	1432.888	33	33	230.05800	230.33764	26	26	
10.40	70.0	1432.888	1433.168	34	34	230.33764	230.61878	26	26	
9.10	90.0	1433.182	1433.462	34	34	230.62964	230.90670	25	25	
9.12	90.0	1433.462	1433.742	34	34	230.90670	231.18268	25	25	



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METHOD 5 CONSOLE CALIBRATION
USING REFERENCE WET GAS METER W-NK-2.5-B-Z No.547425
5-POINT METRIC UNIT

Meter Console Information		Calibration Conditions				Factors/Conversions		
Console Model Number	XC-572-V	Date	Time	09/07/2024	02:10 PM	Std Temp	293	K
Console Serial Number	1904013	Calibration Reference No.	SER24-070022			Std Press	760	mm Hg
DGM Model Number	SK25EX	Barometric Pressure	755.16			K _i	0.386	
DGM Serial Number	00004106	Calibration Meter Gamma	1.001			Console Leak Check	PASS	

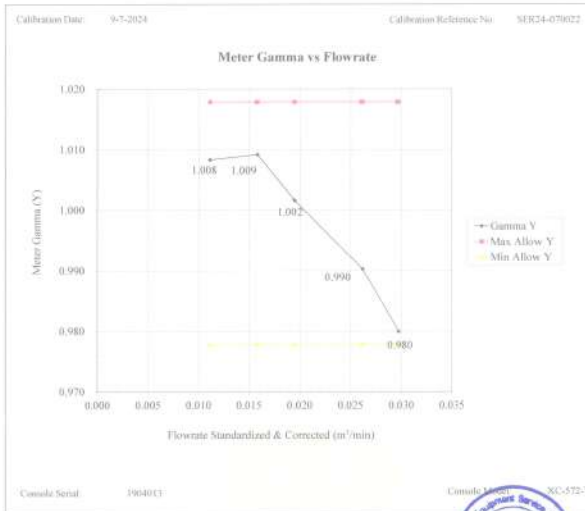
Calibration Data										
Standardized Data					Dry Gas Meter					
Dry Gas Meter		Calibration Meter		Calibration Factor		Flowrate		Std & Corr		Variation
(V _{out})	(Q _{out})	(V _{wout})	(Q _{wout})	(Y)	(ΔY)	(Q _{actual})	(Q _{actual})	(Q _{actual})	(ΔH _g)	
m ³	m ³ /min	m ³	m ³ /min			m ³ /min			mm H ₂ O	(ΔH _g)
0.136	0.011	0.137	0.011	1.007	0.009	0.011			45.827	-0.051
0.136	0.011	0.137	0.011	1.009	0.011	0.011			45.769	-0.108
0.136	0.016	0.138	0.016	1.011	0.013	0.016			45.504	-0.373
0.136	0.016	0.137	0.016	1.008	0.010	0.016			45.938	0.061
0.274	0.019	0.275	0.020	1.004	0.006	0.020			46.487	0.610
0.274	0.020	0.273	0.020	0.999	0.001	0.020			46.496	0.618
0.274	0.026	0.273	0.026	0.993	-0.005	0.026			45.359	-0.518
0.274	0.026	0.271	0.026	0.988	-0.010	0.026			45.850	-0.028
0.276	0.030	0.271	0.030	0.982	-0.016	0.030			45.510	-0.368
0.276	0.030	0.270	0.030	0.978	-0.020	0.030			46.035	0.157
				0.998	Y Average				45.878	ΔH _g Average

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is ±0.02.

For ΔH_g, orifice pressure differential that equates to 0.75 cm (0.0212 m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2 inches (5.1 mm).

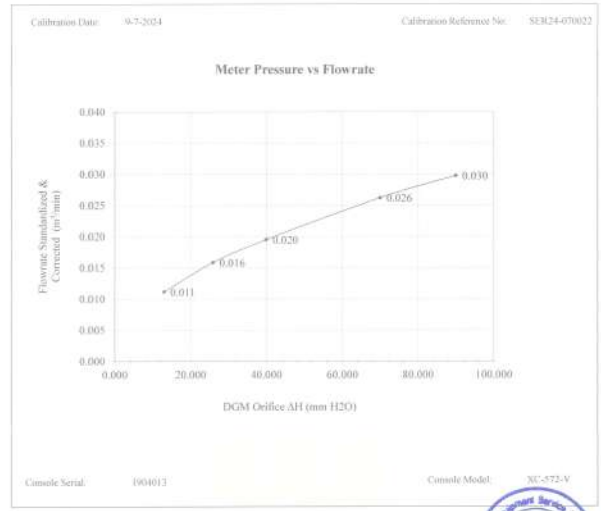
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Meter Console Information		Calibration Conditions				Factors/Conversions		
Console Model Number	XC-572-V	Date	Time	09/07/2024	02:10 PM	Std Temp	293	K
Console Serial Number	1904013	Calibration Reference No.	SER24-070022			Std Press	760	mm Hg
DGM Model Number	SK25EX	Barometric Pressure	755.16			K _i	0.386	
DGM Serial Number	00004106	Calibration Meter Gamma	1.001			Console Leak Check	PASS	



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Meter Console Information		Calibration Conditions				Factors/Conversions		
Console Model Number	XC-572-V	Date	Time	09/07/2024	02:10 PM	Std Temp	293	K
Console Serial Number	1904013	Calibration Reference No.	SER24-070022			Std Press	760	mm Hg
DGM Model Number	SK25EX	Barometric Pressure	755.16			K _i	0.386	
DGM Serial Number	00004106	Calibration Meter Gamma	1.001			Console Leak Check	PASS	



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THERMOCOUPLES SYSTEM CALIBRATION

Sampling System Equipment Information	
Console Model Number	NC-572-V
Console Serial Number	1904013
DGM Model Number	SK25EX
DGM Serial Number	00004106
Meter Box Model Number	JENCO 765 KF
Meter Box Serial Number	JC 19780

Calibration Conditions			
Date	Time	09/07/2024	04:15 PM
Calibration Reference No.		SER24-070022	
Reference Thermometer		DIGICON	
Serial Number		183169105	

Results											
Console Thermocouple Simulator											
Channel and test point	Meter Box Channel Temperature Reading (°C)										
	-18.0	25.0	38.0	93.0	149.0	260.0	371.0	482.0	593.0	816.0	1038.0
Stack	-17.0	26.0	39.0	94.0	149.0	256.0	367.0	475.0	584.0	805.0	1038.0
Aux	-17.0	26.0	39.0	94.0	149.0						
Probe	-17.0	26.0	39.0	94.0	149.0						
Filter	-17.0	26.0	39.0	94.0	149.0						
Oven	-17.0	26.0	39.0	94.0	149.0						
Exit	-17.0	26.0	39.0								

		Tolerance Range			
Stack	± 1.50%	Absolute		Meter	± 3.0 °C
Probe	± 3.0 °C			Exit	± 2.0 °C
Filter	± 3.0 °C				



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CERTIFICATE OF ANALYSIS
Grade of Product: EPA PROTOCOL STANDARD

Customer: AIR LIQUIDE (THAILAND)
LTD.
Part Number: E05N191E15A0014
Cylinder Number: EB0162121
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12023
Gas Code: CO,CO2,NO,NOX,SO2,BALN
Reference Number: 180-402772205-1
Cylinder Volume: 144.0 CF
Cylinder Pressure: 2016 PSIG
Valve Outlet: 660
Certification Date: Jul 06, 2023
Expiration Date: Jul 06, 2031

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA-820R-12-013, using the assay procedures listed. Analytical Metrology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results apply only to the same lot. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	100.0 PPM	100.4 PPM	G1	±0.9% NIST Traceable	06/27/2023, 07/06/2023
NITRIC OXIDE	100.0 PPM	100.2 PPM	G1	±0.9% NIST Traceable	06/27/2023, 07/06/2023
SULFUR DIOXIDE	100.0 PPM	100.0 PPM	G1	±1.4% NIST Traceable	06/27/2023, 07/06/2023
CARBON MONOXIDE	200.0 PPM	199.2 PPM	G1	±0.3% NIST Traceable	06/26/2023
CARBON DIOXIDE	8.000 %	7.982 %	G1	±1.2% NIST Traceable	06/27/2023
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
GMS	104202308	CC754364	98.30 PPM NITRIC OXIDE/NITROGEN	±0.4%	Jan 04, 2031
PRM	C2219101	APE1514048	100.19 PPM NITRIC OXIDE/NITROGEN	±0.3%	Feb 28, 2025
GMS	2023042525	CC754381	98.52 PPM NITRIC OXIDE/NITROGEN	±0.4%	Apr 25, 2031
PRM	13409	D913660	15.01 PPM NITROGEN DIOXIDE/AIR	±1.6%	Feb 17, 2023
GMS	15340020202	EB0130037	9.893 PPM NITROGEN DIOXIDE/NITROGEN	±1.6%	Sep 29, 2025
NTRM	160102-22	KAL003920	97.89 PPM SULFUR DIOXIDE/NITROGEN	±0.8%	Nov 01, 2027
CO	230601	CC745902	249.47 PPM CARBON MONOXIDE/NITROGEN	±0.3%	Dec 09, 2028
NTRM	130605-02	CC411730	33.359 % CARBON DIOXIDE/NITROGEN	±0.6%	May 14, 2025

The GMS, NTRM, PRM, or RGM noted above is only in reference to the GMS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT			
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration	
Nicolet iS50 FTIR AUP2010245 CD2	FTIR	Jun 15, 2023	
SIEMENS ULTRAAMATE N1-CB-180	NDIR	Jun 14, 2023	
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Jun 29, 2023	
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Jun 15, 2023	
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Jun 08, 2023	

Approved for Release

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List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Analytical Balance	FAT OIL AND GREASE	Mettler Toledo	AB204-S/FACT / 1129361010	Technology Promotion Association (Thailand-Japan)	24MM292	11/5/2024	10/5/2025
			Mettler Toledo	AB204-S/FACT / 1129361010	United Analyst and Engineering Consultant Co., Ltd.	250422 1 BL002 25	23/4/2025	22/4/2026
2	Analytical Balance	TOTAL DISSOLVED SOLIDS	Mettler Toledo	XSR205DU / C210685394	National Food Institute,Ministry of Industry, Thailand	2402283-002-01	2/4/2024	1/4/2025
			Mettler Toledo	XSR205DU / C210685394	National Food Institute,Ministry of Industry, Thailand	2502226-002-01	20/3/2025	19/3/2026
3	Analytical Balance	TOTAL SUSPENDED SOLIDS	Mettler Toledo	XSR205DU / C009071872	National Food Institute,Ministry of Industry, Thailand	2402283-001-01	2/4/2024	1/4/2025
			Mettler Toledo	XSR205DU / C009071872	National Food Institute,Ministry of Industry, Thailand	2502226-001-01	20/3/2025	19/3/2026
4	DO Meter	BIOCHEMICAL OXYGEN DEMAND	YSI	5100 / 11B 101863	Technology Promotion Association (Thailand-Japan)	25TW29	18/2/2025	16/2/2026
5	Heating Block	CHEMICAL OXYGEN DEMAND	Hanna Instruments Italia Srl.	HI 839800-02 / H 018500 I	Hanna Instruments (Thailand) Ltd.	HIT-2510-0375	7/3/2025	6/3/2026
6	Heating Block	CHEMICAL OXYGEN DEMAND	Hanna Instruments Inc.(Romania)	HI839800-02 / 4500052101	Hanna Instruments (Thailand) Ltd.	HIT-2427-0942	1/7/2024	30/6/2025
7	Hot Air Oven	TOTAL SUSPENDED SOLIDS	Memmert	UF55 / B212.0411	Technology Promotion Association (Thailand-Japan)	24TM589	1/4/2024	31/3/2025
8	Kjeltec Distillation Unit	TOTAL KJELDAHL NITROGEN	FOSS	KT9 / 91905393	FOSS South East Asia	12875	5/7/2024	4/7/2025
9	Kjeltec System Distilling Unit	TOTAL KJELDAHL NITROGEN	Foss Tecator (Labtec)	KT200 / 91790524	FOSS South East Asia	13319	27/1/2025	26/1/2026

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
10	Kjeltec Distillation Unit	TOTAL KJELDAHL NITROGEN	FOSS	Kjeltec 8100 / 91889052	FOSS South East Asia	13854	24/2/2025	23/2/2026
11	pH Meter	pH	Horiba	LAQUA-PH210 / HA9M0048	technology promotion association (thailand-japan)	24CH723	19/6/2024	17/6/2025
12	pH Meter	pH	Horiba	LAQUA-PH210 / HA0A0005	technology promotion association (thailand-japan)	24CH1597	26/12/2024	24/12/2025
13	pH Meter	pH	Horiba	LAQUA-PH210 / HA9M0047	technology promotion association (thailand-japan)	24CH400	3/4/2024	1/4/2025
14	pH Meter	pH	Horiba	LAQUA-PH210 / HA0E0041	technology promotion association (thailand-japan)	24CH725	19/6/2024	17/6/2025
15	Spectrophotometer	COLOUR (pH 7.0) COLOUR (pH Sample)	Agilent	Cary 60 G6860A / MY15410009	DQE Services Co.,Ltd.	SP24-018	7/5/2024	6/5/2025
16	UV-VIS Spectrophotometer	NITRATE SULPHATE	Hitachi	U-2900 / 21E22-009	DQE Services Co.,Ltd.	SP25-001	3/1/2025	2/1/2026
17	UV/VIS Spectrophotometer	AMMONIA-NITROGEN NITRATE NITROGEN	Hitachi	U-5100 / 23A4-008	DQE Services Co.,Ltd.	SP24-028	11/9/2024	9/9/2025

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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
114 HATTAYAKORN ROAD SOI 18, SUANLUANG, SAKONNAGARANG, BANGKOK 105
TEL. 0 27 7 300 29 FAX. 0 2713 2546



Cert. No.: 24CH400
Page: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Honba
Model : LAQUA-PH210
Serial No. : HASMC047
ID No. : UAE.EFM.005/2563(EFM.pH 05/63)
Condition As-Received : Used Item
Received Date : 01 April 2024
Calibration Date : 02 April 2024
Reference : 2404-0037W5G-2
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phra Khanong, Bangkok 10260

Ambient Temperature : $(25 \pm 2.5) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Calibration Procedure : In-house method ;
- CH-CH5 by direct measurement with DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH5 by comparison with temperature standard

Calibrated by : Warakorn Lengagtrakul

Approved by :
Approved Signatory

() Pomteppa Taneyakul
() Unnophol Harachai
(x) Sathip Meangmai

Issue Date : 06 April 2024

The Uncertainties are for a confidence probability of approximately 95 %

The measurement of temperature is other than $20 ^\circ\text{C}$ except with the procedure
specified in the ISO 9001:2015 Calibration and Testing Services

A 0062140



Cert. No.: 24CH400
Page: 2 of 3

Condition of this calibration result

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030048	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4882054	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.,
ANISI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	940102	27 Nov 2025
pH 6.866	CPA chem	940104	02 Nov 2024
pH 9.997	CPA chem	940105	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 Document Process Calibrator at pH (4.7)(7.10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (mV)	Coverage factor k
			mV	pH		
pH Meter S/N : HA8M0047	4.00	177.48	-77.3	4.01	0.058	2.00
	7.00	0.00	0.0	7.01	0.058	2.00
	7.00	0.00	0.0	7.01	0.058	2.00
	10.00	-177.48	-177.4	10.01	0.058	2.00

a 1209883



Cert. No.: 24CH400
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 (t)	Coverage factor k
pH Electrode S/N : -	4.008	4.01	171.6	0.0079	2.00
	6.866	6.99	-8.4	0.0099	2.00
	6.986	7.00	-9.6	0.011	2.00
	9.997	10.02	173.8	0.0086	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe:

- Model : -
- Serial No. : -
- Dimension of probe :
- Length : 103 mm.
- Diameter : 16 mm.
- Immersion Depth : 90 mm.

Calibration Point ($^{\circ}\text{C}$)	Standard Temperature ($^{\circ}\text{C}$)	UUC* Reading ($^{\circ}\text{C}$)	Error ($^{\circ}\text{C}$)	Uncertainty of measurement ($\pm ^{\circ}\text{C}$)	Coverage factor k
25.0	25.002	25.0	-0.002	0.15	2.00
30.0	30.002	30.0	-0.002	0.15	2.00
35.0	35.003	35.0	-0.003	0.15	2.00

Remark : - UUC* = Urr: 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 %.

-000-

a 1209884

DQE Services Co., Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

CERTIFICATE OF CALIBRATION

Certificate No. : SP25-001 Page 1 of 5

Customer : United Analyst and Engineering Consultant Co., Ltd. (Head Office)

Address : 3 Soi Udomsuk 41, Sukhumvit Road, Bangchak, Phra Khanong, Bangkok 10260

Location of calibration : Laboratory 213

Equipment : UV-Vis Spectrophotometer

Manufacturer : Hitachi

Model : U-2900

Serial No. : 21E22-009

ID No. : UAE.WAT.051/2564

Received Date : 3 January 2025

Calibration Date : 3 January 2025

Issue Date : 8 January 2025

Condition Instrument : Good

Calibrated by :
(Mr. Tanawut Rittidach)
Technical Manager

Approved by :
(Ms. Chonthicha Sangngern)
Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurement realized at the corresponding national standards laboratory. This certificate may not be reproduced other than in full except with the prior written consent of the laboratory.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



REPORT OF CALIBRATION

Certificate No. : SP25-001

Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C

Relative humidity 55 ± 20 %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

Traceability : This certification is traceable to the International System of Unit maintained at National -

Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 200 nm/min

Scan Interval of UUC : 0.1 nm.


Resolution of UUC : Photometric 0.001 Abs.

Wavelength 0.1 nm.

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021

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32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



REPORT OF CALIBRATION

Certificate No. : SP25-001

Page 3 of 5

Calibration Results : Without adjustment


Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5780	0.578	0.0000	0.0031	2.00
	1.0484	1.045	0.0034	0.0029	2.00
	2.1876	2.192	-0.0044	0.0075	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.560	-0.0005	0.0034	2.00
	1.0239	1.023	0.0009	0.0035	2.00
	2.1230	2.125	-0.0020	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.521	0.0020	0.0030	2.00
	0.9633	0.961	0.0023	0.0029	2.00
	1.9753	1.977	-0.0017	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.518	0.0001	0.0031	2.00
	1.0002	0.998	0.0022	0.0033	2.00
	1.9973	1.993	0.0043	0.0084	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.552	-0.0003	0.0030	2.00
	1.0803	1.079	0.0013	0.0030	2.00
	2.0373	2.032	0.0053	0.0079	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.559	0.0001	0.0031	2.00
	1.0518	1.050	0.0018	0.0030	2.00
	1.9274	1.923	0.0044	0.0079	2.00

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FM-708-02 R01 1/11/2021

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



REPORT OF CALIBRATION

Certificate No. : SP25-001

Page 4 of 5


Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.000	0.0000	0.0050	2.00
	0.7469	0.744	0.0029	0.0057	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8674	0.863	0.0044	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2919	0.290	0.0019	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6430	0.640	0.0030	0.0055	2.00

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FM-708-02 R01 1/11/2021

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Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



REPORT OF CALIBRATION

Certificate No. : SP25-001

Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	241.1	0.62	0.18	2.00
279.45	279.0	0.45	0.18	2.00
287.81	287.3	0.51	0.18	2.00
334.06	333.8	0.26	0.18	2.00
360.93	360.6	0.33	0.18	2.00
418.59	418.2	0.39	0.18	2.00
445.94	445.5	0.44	0.18	2.00
453.66	453.4	0.26	0.18	2.00
460.02	459.8	0.22	0.18	2.00
536.59	536.6	-0.01	0.18	2.00
637.98	637.7	0.28	0.18	2.00
431.38	431.1	0.28	0.18	2.00
472.50	472.3	0.20	0.18	2.00
513.47	513.4	0.07	0.18	2.00
528.88	528.9	-0.02	0.18	2.00
573.17	573.3	-0.13	0.18	2.00
585.35	585.1	0.25	0.20	2.00
684.40	684.5	-0.10	0.18	2.00
740.72	741.0	-0.28	0.20	2.00
748.55	748.8	-0.25	0.18	2.00
807.03	807.3	-0.27	0.18	2.00
879.28	879.6	-0.32	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k,

which for a normal distribution corresponds to a coverage probability of approximately 95%

- End of Certificate -

เอกสารไม่ควบคุม

FM-708-02 R01 1/11/2021



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & 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.: 24CH723
Page.: 2 of 3

Certificate of Calibration

Cert.No.: 24CH723
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA9M0048
ID No. : UAE.EFM.003/2563(EFM.pH.03/63)
Condition As-Received : Used Item
Received Date : 18 June 2024
Calibration Date : 19 June 2024
Reference : 24CG-0570WSC-1
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : $(25 \pm 2.5) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lermgatrakul

Approved by :
Approved Signatory

() Unnophol Haratchai
() Ponpan Paipim
(x) Sathip Meangma

Issue Date : 20 June 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 & Equipment Calibration and Testing Services.

Condition of this calibration result

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	231908	28 July 2024

- This Certification is traceable to SI 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-1635

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	970851	25 Apr 2028
pH 6.986	CPA chem	970852	25 Apr 2026
pH 9.927	CPA chem	970853	25 Apr 2025

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 Document Process Calibrator at pH (4.7)(7.10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
			mV	pH		
pH Meter S/N : HA9M0048	4.00	177.48	177.6	4.01	0.058	2.00
	7.00	0.00	0.2	7.00	0.058	2.00
	7.00	0.00	0.2	7.00	0.058	2.00
	10.00	-177.48	-177.3	10.01	0.058	2.00



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
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534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL.0-2717-3000-29 FAX.0-2719-9484



Cert.No.: 24CH723
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 (\pm)	Coverage factor k
pH Electrode S/N : Q9AD0211	4.008	4.01	176.4	0.0079	2.00
	6.986	7.00	0.7	0.0093	2.00
	6.986	7.01	0.7	0.0093	2.00
	9.997	10.01	-172.2	0.0092	2.00

Function : Temperature Measurement

($^\circ\text{C}$) Without adjustment

This equipment was connected with Temperature Probe:

- Model : 9652-10D

- Serial No. : Q9AD0211

Dimension of probe

- Length : 100 mm.

- Diameter : 16 mm.

- Immersion Depth : 80 mm.

Calibration Point ($^\circ\text{C}$)	Standard Temperature ($^\circ\text{C}$)	UUC* Reading ($^\circ\text{C}$)	Error ($^\circ\text{C}$)	Uncertainty of measurement (\pm $^\circ\text{C}$)	Coverage factor k
25.0	25.002	25.0	-0.002	0.13	2.00
30.0	30.001	30.0	-0.001	0.13	2.00
35.0	35.004	35.0	-0.004	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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Certificate of Calibration

Cert.No.: 24CH725
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA0E0041
ID No. : UAE.EFM.069/2564(EFM.pH.02/64)
Condition As-Received : Used Item
Received Date : 18 June 2024
Calibration Date : 19 June 2024
Reference : 24CG-0570WSC-3
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phrakhanong, Bangkok 10260

Ambient Temperature : $(25 \pm 2.5) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15) \%$
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by : Warakorn Lermgatrakul

Approved by :
Approved Signatory

() Unnophol Haratchai
() Ponpan Paipim
(x) Sathip Meangma

Issue Date : 20 June 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 & Equipment Calibration and Testing Services.



Cert.No.: 24CH725
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	130RC118	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	11CRC044	23RC8	28 July 2024

- This Certification is traceable to SI 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-1635

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	970851	25 Apr 2026
pH 6.866	CPA chem	970852	25 Apr 2025
pH 9.997	CPA chem	970853	25 Apr 2025

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 Document Process Calibrator at pH (4.7)(7.10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	pH		
pH Meter S/N.: HA0E0041	4.00	177.48	177.4	4.01	0.058	2.00
	7.00	0.00	0.1	7.00	0.058	2.00
	7.00	0.00	0.1	7.00	0.058	2.00
	10.00	-177.48	-177.2	10.01	0.058	2.00



Cert.No.: 24CH725
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.: QBAA0001	4.008	4.01	-77.6	0.0085	2.05
	6.868	7.00	2.5	0.012	2.05
	6.866	7.00	3	0.014	2.00
	9.997	10.01	-170.8	0.0092	2.00

Function : Temperature Measurement

($^{\circ}$ C) Without adjustment

This equipment was connected with Temperature Probe;

- Model : 9852-100

- Serial No. : QBAA0001

Dimension of probe

- Length : 103 mm.

- Diameter : 16 mm.

- Immersion Depth : 80 mm.

Calibration Point ($^{\circ}$ C)	Standard Temperature ($^{\circ}$ C)	UUC* Reading ($^{\circ}$ C)	Error ($^{\circ}$ C)	Uncertainty of measurement (\pm $^{\circ}$ C)	Coverage factor k
25.0	25.004	25.0	-0.004	0.13	2.00
30.0	30.002	30.0	-0.002	0.13	2.00
35.0	35.002	35.0	-0.002	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 %

-090-



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PHU VAKKARIN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL 0-2717-3000-29 FAX 0-2718-9484



Certificate of Calibration

Cert.No.: 24CH1697
Page.: 1 of 3

Equipment : pH Meter
Manufacturer : Horiba
Model : LAQUA-PH210
Serial No. : HA0A0005
ID No. : UAE.F.M.G04/2863(EFM, pH 04163)
Condition As-Received : Used Item
Received Date : 24 December 2024
Calibration Date : 28 December 2024
Reference : 2412-0601/WSC-2
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road,
Bangchak, Phra Khanong Bangkok 10260

Ambient Temperature : (25 \pm 2.5) $^{\circ}$ C
Relative Humidity : (50 \pm 15) %
Calibration Procedure : In-house method
- CP-CH5 by direct measurement with DC voltage standard and direct measurement with certified reference material (CRM)
- CP-CH6 by comparison with temperature standard

Calibrated by : Waiworn Lengagatrakul

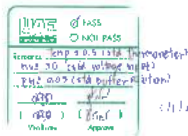
Approved by :
Approved Signatory

() Ponthippa Tameysakul
() Porpan Paljorn
(x) Sallhip Meangma

Issue Date : 27 December 2024

The uncertainties are for a confidence probability of approximately 95%

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Cart.No.: 24CH1597
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	54030048	130/RC116	24E2753	25 Aug 2025
2) Ref. Standard Thermometer	4982054	110RC044	24E757	14 July 2025

• This Certification is traceable to SI through Technology Promotion Association (Thailand - Japan)

2. Certified Reference Materials

• The measurement results are traceable to SI through Hach Lange GmbH Ltd.,
Deutsche Akkreditierungsstelle, Accredited No. D-RM-15184-01-00
• The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AN-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 4.008	CPA chem	1034203	27 Sep 2026
pH 7.000	Hach Lange GmbH	C03185	08 July 2026
pH 10.010	CPA chem	1034203	27 Sep 2025

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 Document Process Calibrator at pH (4.7,7,10)

Unit Under Calibration	Nominal Value		Standard Voltage Input		Actual Reading		Uncertainty of Measurement (\pm mV)	Coverage factor k
	pH	mV	mV	pH	mV	pH		
pH-Meter S/N: HADAD005	4.00	177.48	177.4	4.01	0.058	2.00	0.058	2.00
	7.00	0.00	0.1	7.00	0.058	2.00		2.00
	7.00	0.00	0.1	7.00	0.058	2.00		2.00
	10.00	-77.48	-177.2	10.01	0.058	2.00		2.00



Cert.No.: 24CH1597
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 (\pm)	Coverage factor k
pH Electrode S/N: -	4.008	4.01	177.2	0.0079	2.00
	7.000	7.00	2.2	0.0092	2.00
	10.010	10.01	-170.9	0.0095	2.00

Function: Temperature Measurement

($^{\circ}$) Without adjustment

This equipment was connected with Temperature Probe;

- Model	-
- Serial No.	-
- Dimension of probe	-
- Length	112 mm
- Diameter	16 mm
- Immersion Depth	100 mm

Calibration Point ($^{\circ}$ C)	Standard Temperature ($^{\circ}$ C)	UUC* Reading ($^{\circ}$ C)	Error ($^{\circ}$ C)	Uncertainty of measurement (\pm $^{\circ}$ C)	Coverage factor k
15.0	15.003	15.0	-0.003	0.13	2.00
30.0	30.001	30.0	-0.001	0.13	2.00
45.0	45.002	45.0	-0.002	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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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



Certificate of Calibration

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

Equipment:	Electronic Balance
Manufacturer:	Mettler Toledo
Model:	AB204-S/FACT
Serial No.:	1129361010
ID No.:	UAE.WAS.002/2552
Submitted by:	United Analyst and Engineering Consultant Co.,Ltd. 3 Soi 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 $^{\circ}$ C to 40 $^{\circ}$ C
Relative Humidity:	30 % to 90 %
Calibrated by:	Khiti Ruttanaprapachai
Approved by:	 Approved Signatory
() Ponpan Paipim	
() Suwit Imjai	
(✓) Kunchit Prompret	

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: 2405-01660C-1
Procedure used :-

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	Balance Reading	Correction	Measurement Uncertainty (\pm mg)	Coverage Factor
(g)	(g)	(g)	(\pm mg)	(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	Standard Deviation of Reading (g)
(g)	
100	0.00007
200	0.00005

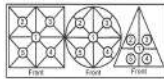
Cert.No.: 24MM292
Page: 2 of 3

เอกสารไม่ควบคุม



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

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



2. Effect of off center loading

A mass of 100 g was placed at various position on the pan.
The weighing machine reading error obtained is given in the table

Position 1 (g)	Position 2 (g)	Position 3 (g)	Position 4 (g)	Position 5 (g)	Maximum difference between off-center and central loading (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



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES
334-4 PATTANAKARN ROAD SOI 18, SIAMLIANG, SIAMLIANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-4944



Cert. No.: 24TM589
Page : 1 of 3

Certificate of Calibration

Equipment : Hot Air Oven
Manufacturer : Memmert
Model : UF 55
Serial No. : B212.0411
ID No. : UAE.WAO.005/2556
Submitted by : United Analyst and Engineering Consultant Co.,Ltd.
3 Soi Udomsak 41, Sukhumvit Road,
Bangchak, Phrakhanong,
Bangkok 10260
Location : Lab Floor 2
Received Order : 01 April 2024
Calibration Date : 01 - 02 April 2024
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
Calibrated by : Krinda Malee
Approved by :
() Ponpan Palpin
(✓) Suwit Injai
() Kunchit Promprat

Issue Date : 5 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 & Equipment Calibration and Testing Services.

เอกสารไม่ควบคุม

A 0055065



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Procedure Used :-

Cert. No.: 24TM589
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) and Thermocouple Type T.

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	MY57013711	23LM115	TPA	11 Jul 2024

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

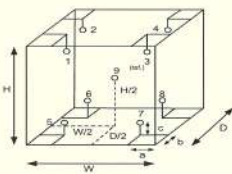
3. This certification is traceable to the International System of Unit.

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

Result of Calibration :- () Without Adjustment

Function of UUC* : Temperature Source

Fresh air setting : Close



Probe Installation Details : Dimension of Chamber :
a = 5.0 cm D = 0.50 m
b = 5.0 cm W = 0.80 m
c = 5.0 cm H = 0.75 m
Capacity = 0.30 m³

Environment during calibration	
	Beginning
Temp. (°C)	27
REL.Humid. (%)	47
AC Supply (Volt)	221

Ref. Std. ID No.: @ Calibration Point	
Position :	(120 to 180) °C
1	21-18TC-01 22-18RTD-2/1
2	21-18TC-02 18RTD-2/2
3	21-18TC-03 18RTD-2/3
4	21-18TC-04 18RTD-2/4
5	21-18TC-05 18RTD-2/5
6	21-18TC-06 18RTD-2/6
7	21-18TC-07 18RTD-2/7
8	21-18TC-08 18RTD-2/8
9 (ref.)	21-18TC-09 18RTD-2/9

เอกสารไม่ควบคุม
a 1209739



Equipment : Hot Air Oven
Condition As-Received : Used Item
Reference : 2404-0004OC-3
Result of Calibration :- () Without Adjustment
Function of UUC* : Temperature Source
Fresh air setting : Close

Cert. No.: 24TM589
Page : 3 of 3

Calibration Point (°C)	UUC* Setting (°C)	UUC* Reading (°C)	Temperature stability (± °C)	Temperature uniformity (°C)	Overall Variation (°C)	Coverage Factor
104.0	104.0	104.0	0.032	0.47	0.84	2
120.0	120.0	120.0	0.12	0.72	1.3	2
180.0	180.0	180.0	0.13	1.2	1.5	2

Calibration Point (°C)	Measured Temperature (°C)									Uncertainty (± °C)
	1	2	3	4	5	6	7	8	9 (ref.)	
104.0	104.464	103.847	104.226	104.232	104.106	103.691	104.275	104.127	104.013	0.42
120.0	120.486	120.089	120.635	120.596	119.531	119.644	120.364	120.144	120.158	1.1
180.0	180.574	179.769	180.285	180.870	179.594	179.790	180.287	179.961	179.602	1.1

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
a 1209738



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES
334/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2719-3000 FAX: 0-2719-9484

Certificate of Testing

Cert.No.: 25TW29
Page.: 1 of 2

Equipment : DO Meter
Manufacturer : YSI
Model : 5100
Serial No. : 11B 101863
ID No. : UAE.WAO.004/2554
Received Date : 14 February 2025
Test Date : 17 February 2025
Reference : 2502-0473DSC-1
Submitted by : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok,
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 Sitrthean
Approved by :
Approved Signatory
() Chakrit Waewwanjua
() Ponpan Palpim
(✓) Salthip Meangmal
Issue Date : 18 February 2025



Cert.No.: 25TW29
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	24MM131	04 July 2025

2. Standard Material :-

Material	Manufacturer	Lot.No.	Assay
Sodium Thiosulfate 5-Hydrate AR	KEMAUS	2203162447	99.8%

Result : Dissolved Oxygen Meter Adjustment With Air 100 %
Dissolved Oxygen Probe No.: 24F100202

Titration Method (Azide Modification Method) (mg/L)	DO Meter Reading (mg/L)	Standard Deviation (mg/L)
8.22	8.22	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

เอกสารไม่ควบคุม

เอกสารนี้จัดทำขึ้นโดยระบบอัตโนมัติของ TPA และไม่สามารถแก้ไขได้ หากพบข้อผิดพลาด กรุณาแจ้งให้ TPA ทราบ

ใบรับรองการสอบเทียบ (Verification of Certificate)					
Certificate No.: 25TW29					
Brand : YSI					
Serial No.: 11B 101863					
Model : 5100					
ID No.: UAE.WAO.004/2554					
Calibration results					
Titration Method					
Standard	Do meter	Errors	Correction	Total Error	Judgment
Decision	Reading	(mg/L)	(mg/L)	(mg/L)	(mg/L)
8.22	0.0055	0.0010	0.0000	0.02	Pass
Signature : Walalak Sitrthean					
Date : 18/02/2025					
Place : Bangkok					

เอกสารไม่ควบคุม

FOSS

Customer Service Report

Date: 07.05.2024	Customer: UAE	
Job No.: 8375	Address: Bangkok	
Instrument: KT9 Distiller	Serial: 9495393	
Travel To Customer (Hrs): 08.30 - 10.30	Labour (Hrs): 14.30 - 5	Travel From Customer (Hrs): 14.30 - 1.5
Start	Finish	
Job Type		
Application	Special	Standard
Distributor	Courtesy Visit	Installation
Digital Service	PMA Onboarding	Quote
Internal	Warranty	Repair
Investigate	Sales Support	Remote
		Health Check Visit
PMA Type		
Smartcare	Smartcare Pro	Fosscore
Smartcare Advance	Fosscore Pro	N/A
Details of Work / Test		
- PM -		
- Visual Check -		
+ No leak		
+ No damage		
- Change PM Kit x1 set - OK		
- Function Check -		
+ Dilution 10ml → 9.5ml		
+ Alkali Band → N/A		
+ Receiver N/A → N/A		
+ Screen / Drain		
Alkaline = Recovery = 100% SD =		
Follow up		
Instrument Ready for Use		
OK	X	Not OK*
Part No: 60100106	Batch: 03.01.2020	Description: PM kit for KT9 Distiller
Qty: 1		

I confirm this report is accurate and complete	
Signed FOSS	Signed Customer
Name: Anurak / Sathit	Name: Anurak Sathit
Email:	Customer Contact:
*Remark:	

เอกสารไม่ควบคุม

FOSS

Customer Service Report

Date: 24 Feb 2025
Job No.: 11675
Instrument: K1200

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

Report No.: 13319
Customer: UAE
Address: Bangkok
Serial: 9190524

Start: 09:00
Finish: 10:00

Travel To Customer (Hrs): 1
Labour (Hrs): 10:00
Travel From Customer (Hrs): 3

Application	Special	Standard
Distributor	Courtesy Visit	Installation
Digital Service	PMA Onboarding	Quote
Internal	Warranty	Repair
Investigate	Sales Support	Remote
		Health Check Visit

PMA Type	Smartcare	Smartcare Pro	Fossicare
	Smartcare Advance	Fossicare Pro	N/A

Details of Work / Test

- PM -
+ Visual Check -
- No Leak -
- hose damage on heater & main switch -
- 1 hose heater 10. main switch laboratory Vio -
+ 11.64 PM kit & 1 set -
+ Function Check -
- Power on/off -
- All -
- Steam -
- Condenser -

Instrument Ready for Use: OK

Part No.	Batch	Description	Qty
10003925	11.06.2022	FOSS PM kit K1200 better Analyser/2100	1
10003512	28.03.2024	Heating element Steam	1
10003011	11.10.2022	Switch & 11.64 PM kit	1

I confirm this report is accurate and complete

Signed FOSS: [Signature]
Name: [Name]

Signed Customer: [Signature]
Name: [Name]

Email: [Email]
Customer Contact: [Email]

*Remark: เอกสารไม่ควบคุม

FOSS

Customer Service Report

Date: 24 February 2025
Job No.: 11735
Instrument: K12100

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

Report No.: 13854
Customer: UAE
Address: Bangkok
Serial: 91887052

Start: 09:00
Finish: 10:00

Travel To Customer (Hrs): 2hr
Labour (Hrs): 09:00-10:00
Travel From Customer (Hrs): 1hr

Application	Special	Standard
Distributor	Courtesy Visit	Installation
Digital Service	PMA Onboarding	Quote
Internal	Warranty	Repair
Investigate	Sales Support	Remote
		Health Check Visit

PMA Type	Smartcare	x	Smartcare Pro	x	Fossicare	x
	Smartcare Advance	x	Fossicare Pro	x	N/A	x

Details of Work / Test

- PM -
- test before 0m
- cleaning kit 0m - 36 mo replace
- fishing filter pump
- test operation
- Distillation 60 - 80 ml
- Distillation 6 min 150 - 170 ml
- All gas
- All gas

Instrument Ready for Use: OK

Part No.	Batch	Description	Qty
60031810	08.01.2024	FOSS PM kit K12100 1200 36 Mo	1

I confirm this report is accurate and complete

Signed FOSS: [Signature]
Name: [Name]

Signed Customer: [Signature]
Name: [Name]

Email: [Email]
Customer Contact: [Email]

*Remark: เอกสารไม่ควบคุม

Please scan QR code

UAE United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
Tel: 02-2763 2828 Fax: 02-2763 2800 www.uaec consultant.com E-mail: uaec@uaec consultant.com



Certificate of Calibration

Certificate No.: 250422-1-BL002-25

Code No.: BL002-25

Page: 1 of 3

Customer Name: United Analyst and Engineering Consultant Co., Ltd.
Address: 3 Soi Udom suk 41, Sukhumvit Rd., Bang Chak, Phrakhanong, Bangkok 10260

Equipment: Electronic Balance

Manufacturer: Mettler Toledo

Model: AB204-S/FACT

Serial No.: 1129361010

Asset No.: UAE.WAS.002/2552

Building: N/A

Floor: 1

Room: 107

Received Date: April 22, 2025

Date of Calibration: April 23, 2025

Calibration Conditions: Temperature 22.8 °C to 23.4 °C
Humidity 54.8 % to 68.9 %
Pressure 756.6 mmHg to 758.2 mmHg

Calibrated by: Sakkarin Srinahang

Approved by: Suwit Chotnok

Signature: [Signature]

Issued Date: April 25, 2025

Note: 1) The Uncertainties are for a confidence probability of approximately 95%

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

3) 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 United Analyst and Engineering Consultant Co., Ltd. (UAE)

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UAE United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Road, Bangkok, Phrakhanong, Bangkok 10260
Tel: 02-2763 2828 Fax: 02-2763 2800 www.uaec consultant.com E-mail: uaec@uaec consultant.com



Certificate No.: 250422-1-BL002-25

Code No.: BL002-25

Page: 2 of 3

Equipment: Electronic Balance

Model: AB204-S/FACT

Serial No.: 1129361010

Max. Capacity: 220 g

Calibration Date: April 23, 2025

Condition As-Received: In Condition

Manufacturer: Mettler Toledo

Readability: 0.0001 g

ID No.: UAE.WAS.002/2552

Condition of Equipment:

Condition of This Result of Calibration:

1. Calibration Method: This instrument was calibrated by method U.A.E.C.F.CAL.006 In-House Method based on UKAS Lab 14 - 2022

2. Reference Standards:

Reference Standard	Model	Serial No.	Calibrated By	Certificate No.	Traceability	Due Date
Standard Weight Class E2 (IDML)	1 mg to 1 kg	8749109122	AMARC	25-009359	Mettler-Toledo	21-Jan-27
Standard Weight Class F1 (IDML)	1 mg to 200 g	11119512	AMARC	24-013840	Mettler-Toledo	04-Feb-26

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Traceability	Due Date
Thermo-Hygro-Baro Meter	MHB-38210	AK-46437	SUCCESS	SG-H-0099767	Success Gateway	21-Nov-25
Thermo-Hygro-Baro Meter	MHB-38210	AK-46437	TPA	257795	TPA	25-Feb-26

3. This certification is traceable to SI Unit

4. This certification 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.

6. Through the reference standard laboratory of AMARC 25-009359 Calibration 0152

Calibration Result:

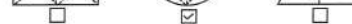
1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
200*	0.000045

2. Eccentric or off-center loading

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	Maximum Difference (g)
(g)	(g)	(g)	(g)	(g)	(g)
100.0000	99.9996	99.9997	100.0003	100.0005	0.0005

เอกสารไม่ควบคุม

Calibration Report

Certificate No.: 2402283-001-01
Equipment: Electronic Balance
Manufacturer: METTLER TOLEDO
Model: XSR205DU
Resolution: 0.0001 g / 0.0001 g
Serial No.: C09071872
ID No.: UAE.WAO.010/2563
Capacity: 220 g

Date of Calibration: 2 April 2024
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	90.00000	0.00010	0.00015	2.00
100	100.00006	100.00000	0.00006	0.00015	2.00
110	110.00007	110.00001	0.00006	0.00017	2.00
120	120.00009	120.00000	0.00009	0.00018	2.00
130	130.00010	130.00000	0.00010	0.00019	2.00
140	140.00014	140.00000	0.00014	0.00020	2.00
150	150.00009	150.00001	0.00008	0.00020	2.00
160	160.00010	160.00001	0.00009	0.00022	2.00
170	170.00012	170.00001	0.00011	0.00023	2.00
200	200.00016	200.00000	0.00016	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

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

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

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
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-RA-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	B505567572	TCS	M23048535	9 April 2024
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-hygro Meter	608-H1	NFI.BT1 016/23	Quality Reborn	QR24-0343	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:

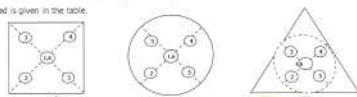
1. Repeatability of Reading:

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
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
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 k
Unloaded	0.000000	0.00000	0.00000	0.0000096	2.00
0.001	0.001003	0.00101	-0.00001	0.0000099	2.00
0.005	0.005003	0.00500	0.00000	0.0000092	2.00
0.01	0.010003	0.01000	0.00000	0.0000089	2.00
0.05	0.049996	0.05000	0.00000	0.0000096	2.00
0.1	0.100011	0.10000	0.00001	0.000011	2.00
0.5	0.500016	0.50001	0.00001	0.000014	2.00
1	1.000003	1.00002	-0.00002	0.000016	2.00
2	2.000023	2.00001	0.00001	0.000017	2.00
5	5.000017	5.00002	0.00000	0.000020	2.00
10	10.000004	10.00000	0.00001	0.000026	2.00
20	20.000031	20.00000	0.00003	0.000037	2.00
30	30.000040	30.00001	0.00003	0.000050	2.00
50	50.000028	50.00002	0.00001	0.000068	2.00
80	80.000068	80.00002	0.00005	0.00011	2.00

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

Calibration Report

Certificate No.: 2402283-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C21685394
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.010/2565

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	90.00019	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

Calibration Report

Certificate No.: 2502226-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 82 g / 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 20 March 2025 **Page 2 of 4**

Environment Condition: Ambient Temperature: 21.2 ± 0.6 °C; Relative Humidity: 48 ± 3.5 %

Place of Calibration: 208 Balance Room, UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.

Condition of Equipment: Good Condition

Condition of This Results of Calibration:

1. Calibration Method: NFI Method W-NA-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	B50556752	TCS	M24011005	19 April 2025
Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hydro Meter	608-H1	NFI.BTH.012/23	Quality Reborn	QR25-0542	10 February 2026

3. This certification is traceable to SI UNIT

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

5. The 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	0.000052
80	0.000042
100	0.000006
200	0.000000

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)
100.0001	100.0001	100.0001	100.0001	100.0001	100.0002	0.0001

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

Calibration Certificate

Certificate No.: 2502226-001-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO.,LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XSR205DU

Serial No.: C09071872

ID No.: UAE.WAO.012/2563

Order No.: 2502226

Operation No.: 2502226-001

Date of Receipt: 19 March 2025

Date of Calibration: 20 March 2025

Calibrated by Mr.Yothin Charoensuk
Scientist

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

Date of Issue: 25 March 2025

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.: 2502226-001-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C09071872
Capacity: 82 g / 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.0001 g
ID No.: UAE.WAO.012/2563

Date of Calibration: 20 March 2025 **Page 3 of 4**

Calibration Results: (Continued)

Calibration Range: 0-80 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: 0 - 82 g; Resolution: 0.0001 g)

Nominal Value (g)	Standard Value (g)	Average Reading (g)	Correction (g)	Uncertainty (±g)	Coverage Factor k
Unloaded	0.000000	0.000000	0.000000	0.0000089	2.00
0.001	0.001003	0.001000	0.000000	0.0000092	2.00
0.005	0.005002	0.005000	0.000000	0.0000094	2.00
0.01	0.010003	0.010000	0.000000	0.0000093	2.00
0.05	0.049996	0.050000	0.000000	0.0000098	2.00
0.1	0.100011	0.100000	0.000001	0.000011	2.00
0.5	0.500016	0.500000	0.000002	0.000014	2.00
1	1.000003	1.000001	-0.000001	0.000016	2.00
2	2.000023	2.000005	-0.000002	0.000017	2.00
5	5.000015	5.000005	-0.000003	0.000021	2.00
10	10.000009	10.000005	-0.000004	0.000026	2.00
20	20.000030	20.000012	-0.000009	0.000037	2.00
30	30.000039	30.000012	-0.000008	0.000050	2.00
50	50.000028	50.000014	-0.000001	0.000068	2.00
80	80.000067	80.000020	-0.000033	0.00011	2.00

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

Calibration Report

Certificate No.: 2502226-002-01
Equipment: Electronic Balance
Model: XSR205DU
Serial No.: C210685394
Capacity: 82 g / 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g / 0.001 g
ID No.: UAE.WAO.010/2565

Date of Calibration: 20 March 2025

Page 4 of 4

Calibration Results: (Continued)

Calibration Range: >80-200 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value: (Range: >80 - 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	90.0002	-0.0001	0.00015	2.00
100	100.00006	100.0001	0.0000	0.00016	2.00
110	110.00007	110.0002	-0.0001	0.00017	2.00
120	120.00009	120.0002	-0.0001	0.00018	2.00
130	130.00010	130.0002	-0.0001	0.00019	2.00
140	140.00013	140.0002	-0.0001	0.00019	2.00
150	150.00009	150.0002	-0.0001	0.00021	2.00
160	160.00010	160.0002	-0.0001	0.00022	2.00
170	170.00012	170.0002	-0.0001	0.00023	2.00
200	200.00013	200.0002	-0.0001	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-05-012 Revision: 01 Date: 20-04-65

ศูนย์ทดสอบและพัฒนาอาหารเพื่ออุตสาหกรรม (Food Industrial Laboratory Service Center) **เอกสารไม่ควบคุม**
10005 Soi 36, Muang Thani Road, Bang Khun Si District, Bangkok 10700, Thailand
Tel: +662-010-8888 Fax: +662-010-8889 Email: nfi@nfi.or.th



Certificate No. : HIT-2427-0942

Page : 1 of 2

CERTIFICATE OF CALIBRATION

Equipment : COD Test Tube Heater
Meter Model : HI839800-02
Tube Heater : 25 Vial Capacity
Temperature Range : (-10 to 160)°C
Manufacturer : Hanna Instruments
Condition As-Received : Used Product
Ambient Temperature : (25 ± 2)°C
Customer name : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Rd., Bangchak,
Phrakhanong, Bangkok 10260

Serial No. : 04500052101

Resolution : 0.1°C

Temperature of Reaction : 150°C

Made in : Romania

Reference : RE241152

Relative Humidity : (50 ± 15)% RH

Received date : 26 June 2024

Calibrate date : 1 July 2024

Issue date : 3 July 2024

Calibrated Location : Hanna Instruments (Thailand) Ltd.

Calibration Procedure : This calibrator was conducted by using in-house: calibration procedure
CP-04 by using certified reference standard instruments.

Calibrated by : ☒ Mr. Pichit Petthong

☐ Mr. Channarong Soinak

Approved by : 

Mr. Anan Suwanchaisakul

Authorized Signatory



This certificate was certified only for the instrument we calibrated.

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

** This certificate may not be reproduced other than in full, except with the prior written **

approval of the head of Hanna Instrument (Thailand).

เอกสารไม่ควบคุม

Certificate No. : HIT-2427-0942

Page : 2 of 2

Condition of this calibration result:

Reference Standard Instruments : This certification is traceable to the international unit of unit maintained through:

Instruments	Model	Serial No.	Certificate No.	Traceable
Data Acquisition Switch Unit	34970A	MY44065265	WK2307-164-1	WK Electric Co., Ltd.
Digital Thermo-Hygrometer	HT-771SD	AL07155	24H41	Technology Promotion Association (Thailand-Japan).

Calibration Result:

Measurement Temperature Source Accuracy for COD Reactor.

Capacity (Vial)	Nominal Value (°C)	Average Value (°C)	Uncertainty of Measurement (±°C)
25 Vial	150.0	149.8	0.48

Unit : °C

(1A)	(2A)	(3A)	(4A)	(5A)
149.574	149.873	149.861	149.748	149.878
(1B)	(2B)	(3B)	(4B)	(5B)
149.490	149.940	149.954	150.103	150.048
(1C)	(2C)	(3C)	(4C)	(5C)
149.625	150.036	150.080	150.015	149.580
(1D)	(2D)	(3D)	(4D)	(5D)
149.801	149.541	149.662	150.010	149.499
(1E)	(2E)	(3E)	(4E)	(5E)
149.563	149.611	149.569	149.831	149.762

Figure: Shows the location of the temperature source.

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

** End of certificate **

เอกสารไม่ควบคุม

Hanna Instruments (Thailand) Ltd.

410/67-68 Soi Ratchadapisek 24, Ratchadapisek Rd., Samen-nok,
Huaykwang, Bangkok 10310 Tel: 0-2541-4199 Fax: 0-2541-4198

Certificate No. : HIT-2510-0375

Page : 1 of 2

CERTIFICATE OF CALIBRATION

Equipment : COD Test Tube Heater
Meter Model : HI839800-02
Tube Heater : 25 Vial Capacity
Temperature Range : (-10 to 160)°C
Manufacturer : Hanna Instruments
Condition As-Received : Used Product
Ambient Temperature : (25 ± 2)°C
Customer name : United Analyst and Engineering Consultant Co., Ltd.
3 Soi Udomsuk 41, Sukhumvit Rd., Bangchak,
Phrakhanong, Bangkok 10260

Serial No. : H0185001

Resolution : 0.1°C

Temperature of Reaction : 150°C

Made in : Romania

Reference : RE250401

Relative Humidity : (50 ± 15) % RH

Received date : 5 March 2025

Calibrate date : 7 March 2025

Issue date : 7 March 2025

Calibrated Location : Hanna Instruments (Thailand) Ltd.

Calibration Procedure : This calibrator was conducted by using in-house: calibration procedure
CP-04 by using certified reference standard instruments.

Calibrated by : ☒ Mr. Pichit Petthong

☐ Mr. Channarong Soinak

Approved by : 

Mr. Anan Suwanchaisakul

Authorized Signatory



This certificate was certified only for the instrument we calibrated.

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

** This certificate may not be reproduced other than in full, except with the prior written **

approval of the head of Hanna Instrument (Thailand).

เอกสารไม่ควบคุม

HANNA

instruments

Certificate No. : HIT-2510-0375

Page : 2 of 2

Condition of this calibration result:

Reference Standard Instruments : This certification is traceable to the international unit of unit maintained through:

Instruments	Model	Serial No.	Certificate No.	Traceable
Data Acquisition Switch Unit	34970A	MY44065265	WK2407-141-1	WK Electric Co., Ltd.
Digital Thermo-Hygrometer	HT-771SD	AL07155	25H171	Technology Promotion Association (Thailand-Japan).

Calibration Result:

Measurement Temperature Source Accuracy for COD Reactor.

Capacity (Vial)	Nominal Value (°C)	Average Value (°C)	Uncertainty of Measurement (±°C)
25 Vial	150.0	150.4	0.47

Unit : °C

(1A)	(2A)	(3A)	(4A)	(5A)
150.407	150.377	150.269	150.402	150.422
(1B)	(2B)	(3B)	(4B)	(5B)
150.426	150.394	150.644	150.690	150.542
(1C)	(2C)	(3C)	(4C)	(5C)
150.477	150.303	150.627	150.257	150.176
(1D)	(2D)	(3D)	(4D)	(5D)
150.462	150.456	150.199	150.406	150.102
(1E)	(2E)	(3E)	(4E)	(5E)
150.185	150.513	150.235	150.460	150.442

Figure: Shows the location of the temperature source.

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

** End of certificate **

เอกสารไม่ควบคุม

DQE

Services

DQE Services Co.,Ltd.

32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230

Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

ISO 17025

LABORATORY DATA

CERTIFICATE OF CALIBRATION

Certificate No. : SP24-018

Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

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

Location of calibration : Laboratory 315

Equipment : UV-Vis Spectrophotometer

Manufacturer : Agilent Technologies

Model : Cary 60

Serial No. : MY15410009

ID No. : UAE.WAT.020/2558

Received Date : 7 May 2024

Calibration Date : 7 May 2024

Issue Date : 9 May 2024

Condition Instrument : Good

Calibrated by :

(Mr.Tunawut Ritidach)

Technical Manager

Approved by :

(Ms. Chonticha Sangngern)

Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit 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 DQE Services Co., Ltd.

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DQE

Services

DQE Services Co.,Ltd.

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Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com

ISO 17025

LABORATORY DATA

REPORT OF CALIBRATION

Certificate No. : SP24-018

Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C

Relative humidity 55 ± 20 %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

Traceability : This certification is traceable to the International System of Unit maintained at National - Institute of Standards and Technology (NIST) through Starna Scientific Limited

Spectral Band Width of UUC : 1.5 nm.

Scan Speed of UUC : 60 nm/min

Scan Interval of UUC : 0.15 nm.

Resolution of UUC : Photometric 0.0001 Abs.

Wavelength 0.1 nm.

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DQE Services Co.,Ltd.

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ISO 17025

LABORATORY DATA

REPORT OF CALIBRATION

Certificate No. : SP24-018

Page 3 of 5


Calibration Results : Without adjustment

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.0000	0.0000	0.0028	2.00
	0.5780	0.5747	0.0033	0.0031	2.00
	1.0484	1.0438	0.0046	0.0029	2.00
	2.1876	2.1832	0.0044	0.0080	2.00
440	0.0000	0.0000	0.0000	0.0028	2.00
	0.5595	0.5581	0.0014	0.0034	2.00
	1.0239	1.0231	0.0008	0.0035	2.00
	2.1230	2.1219	0.0011	0.0080	2.00
465	0.0000	0.0000	0.0000	0.0028	2.00
	0.5230	0.5184	0.0046	0.0030	2.00
	0.9633	0.9614	0.0019	0.0029	2.00
	1.9753	1.9731	0.0022	0.0070	2.00
546.1	0.0000	0.0000	0.0000	0.0028	2.00
	0.5181	0.5150	0.0031	0.0031	2.00
	1.0002	0.9964	0.0038	0.0033	2.00
	1.9973	1.9914	0.0059	0.0088	2.00
590	0.0000	0.0000	0.0000	0.0028	2.00
	0.5517	0.5485	0.0032	0.0030	2.00
	1.0803	1.0772	0.0031	0.0030	2.00
	2.0373	2.0293	0.0080	0.0080	2.00
635	0.0000	0.0000	0.0000	0.0028	2.00
	0.5591	0.5565	0.0026	0.0031	2.00
	1.0518	1.0482	0.0036	0.0030	2.00
	1.9274	1.9202	0.0072	0.0079	2.00

เอกสารไม่ควบคุม

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com




REPORT OF CALIBRATION

Certificate No. : SP24-018Page 4 of 5

Photometric Accuracy :

Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000 0.7469	0.0000 0.7435	0.0000 0.0034	0.0050 0.0057	2.00 2.00
257	0.0000 0.8674	0.0000 0.8639	0.0000 0.0035	0.0050 0.0060	2.00 2.00
313	0.0000 0.2919	0.0000 0.2907	0.0000 0.0012	0.0050 0.0051	2.00 2.00
350	0.0000 0.6430	0.0000 0.6402	0.0000 0.0028	0.0050 0.0055	2.00 2.00

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



REPORT OF CALIBRATION

Certificate No. : SP24-018Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.72	242.0	-0.28	0.18	2.00
279.45	279.5	-0.05	0.18	2.00
287.81	287.9	-0.09	0.18	2.00
334.06	333.9	0.16	0.18	2.00
360.93	360.5	0.43	0.18	2.00
418.59	418.1	0.49	0.18	2.00
445.94	445.6	0.34	0.18	2.00
453.66	453.3	0.36	0.18	2.00
460.02	459.8	0.22	0.18	2.00
536.59	536.0	0.59	0.18	2.00
637.98	638.7	-0.72	0.18	2.00
431.38	430.8	0.58	0.18	2.00
472.50	472.4	0.10	0.18	2.00
513.47	513.7	-0.23	0.18	2.00
528.88	529.1	-0.22	0.18	2.00
573.17	573.5	-0.33	0.18	2.00
585.35	585.2	0.15	0.20	2.00
684.40	685.1	-0.70	0.18	2.00
740.72	741.4	-0.68	0.20	2.00
748.55	749.1	-0.55	0.18	2.00
807.03	807.3	-0.27	0.18	2.00
879.28	879.3	-0.02	0.18	2.00

Remark : - UUC = Unit Under Calibration

- N/A = Not Available

- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a normal distribution corresponds to a coverage probability of approximately 95%.


- * Indicates non TISI accredited

- End of Certificate -

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



CERTIFICATE OF CALIBRATION

Certificate No. : SP24-028Page 1 of 5

Customer : United Analyst and Engineering Consultant Co.,Ltd. (Head Office)

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

Location of calibration : Laboratory 315

Equipment : UV-Vis Spectrophotometer

Manufacturer : HITACHI

Model : U-5100

Serial No. : 23A4-008


ID No. : UAE.WAS.010/2567


Received Date : 10 September 2024

Calibration Date : 10 September 2024

Issue Date : 13 September 2024

Condition Instrument : Good


Calibrated by : 
(Mr. Tanawat Rittidach)
Technical Manager

Approved by : 
(Ms. Chonthicha Sangngern)
Quality Manager

The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

The measurement capability of the laboratory and its traceability to recognized national standards and to the unit of measurements 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 DQE Services Co., Ltd.

DQE Services Co.,Ltd.
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



REPORT OF CALIBRATION

Certificate No. : SP24-028Page 2 of 5

Environment Condition : Ambient Temperature 25 ± 5 °C
Relative humidity 55 ± 20 %RH

Calibration method : In-house method CP-01 Based on ASTM E275-08

Certified Reference Materials :

Material	Serial No.	Certificate No.	Due date
Absorbance Standard set	25760	115663	25 October 2025
Absorbance Standard set	25757	115638	25 October 2025
Wavelength Standard set	25806	115657	25 October 2025
Wavelength Standard set	25758	115665	25 October 2025

Traceability : This certification is traceable to the International System of Unit maintained at National Institute of Standards and Technology (NIST) through Sigma Scientific Limited

Spectral Band Width of UUC : 5.0 nm.

Scan Speed of UUC : 40

Scan Interval of UUC : 0.1 nm.


Resolution of UUC : Photometric 0.001 Abs.
Wavelength 0.1 nm.

เอกสารไม่ควบคุม

เอกสารไม่ควบคุม

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REPORT OF CALIBRATION

Certificate No. : SP24-028

Page 3 of 5

Calibration Results : Without adjustment

Photometric Accuracy :


Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
420	0.0000	0.000	0.0000	0.0028	2.00
	0.5780	0.575	0.0030	0.0031	2.00
	1.0484	1.044	0.0044	0.0029	2.00
	2.1876	2.190	-0.0024	0.0075	2.00
440	0.0000	0.000	0.0000	0.0028	2.00
	0.5595	0.557	0.0025	0.0034	2.00
	1.0239	1.021	0.0029	0.0035	2.00
	2.1230	2.121	0.0020	0.0079	2.00
465	0.0000	0.000	0.0000	0.0028	2.00
	0.5230	0.519	0.0040	0.0029	2.00
	0.9633	0.961	0.0023	0.0028	2.00
	1.9753	1.975	0.0003	0.0070	2.00
546.1	0.0000	0.000	0.0000	0.0028	2.00
	0.5181	0.515	0.0031	0.0031	2.00
	1.0002	0.997	0.0032	0.0033	2.00
	1.9973	1.996	0.0013	0.0085	2.00
590	0.0000	0.000	0.0000	0.0028	2.00
	0.5517	0.549	0.0027	0.0030	2.00
	1.0803	1.078	0.0023	0.0029	2.00
	2.0373	2.031	0.0063	0.0081	2.00
635	0.0000	0.000	0.0000	0.0028	2.00
	0.5591	0.557	0.0021	0.0031	2.00
	1.0518	1.049	0.0028	0.0029	2.00
	1.9274	1.923	0.0044	0.0080	2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/1/2021

DQE Services Co.,Ltd.

DQE Services
32 Soi Ladprao-Wanghin 55, Ladprao-Wanghin Rd., Ladprao, Bangkok 10230
Phone : +66 (0)2 538 2054, Email : dqeservicesinfo@gmail.com



REPORT OF CALIBRATION

Certificate No. : SP24-028

Page 4 of 5

Photometric Accuracy :


Wavelength (nm.)	CRMs Values (Abs)	UUC Reading (Abs)	Correction (Abs)	Uncertainty (Abs)	Coverage factor k
235	0.0000	0.000	0.0000	0.0050	2.00
	0.7469	0.743	0.0039	0.0056	2.00
257	0.0000	0.000	0.0000	0.0050	2.00
	0.8674	0.862	0.0054	0.0059	2.00
313	0.0000	0.000	0.0000	0.0050	2.00
	0.2919	0.291	0.0009	0.0051	2.00
350	0.0000	0.000	0.0000	0.0050	2.00
	0.6430	0.639	0.0040	0.0055	2.00

เอกสารไม่ควบคุม

FM-708-02 R01 1/1/2021

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REPORT OF CALIBRATION

Certificate No. : SP24-028

Page 5 of 5

Wavelength Accuracy :

CRMs Values (nm.)	UUC Reading (nm.)	Correction (nm.)	Uncertainty (nm.)	Coverage factor k
241.00	240.4	0.60	0.18	2.00
279.30	278.7	0.60	0.18	2.00
288.90	288.5	0.40	0.18	2.00
334.50	334.2	0.30	0.18	2.00
361.40	361.1	0.30	0.18	2.00
418.40	418.0	0.40	0.18	2.00
447.20	446.7	0.50	0.18	2.00
459.30	459.6	-0.30	0.18	2.00
537.00	536.6	0.40	0.18	2.00
638.00	637.4	0.60	0.18	2.00
441.29	440.8	0.49	0.18	2.00
479.88	479.6	0.28	0.18	2.00
513.75	513.5	0.25	0.18	2.00
528.59	528.6	-0.01	0.18	2.00
575.10	574.9	0.20	0.18	2.00
585.56	585.3	0.26	0.20	2.00
684.70	684.1	0.60	0.18	2.00
740.51	740.0	0.51	0.20	2.00
747.61	747.2	0.41	0.18	2.00
807.04	806.3	0.74	0.18	2.00
879.68	878.9	0.78	0.18	2.00

Remark : - UUC = Unit Under Calibration
- N/A = Not Available
- The result expanded uncertainty of measurement U is stated as the standard uncertainty of measurement multiplied by the coverage factor k.
which for a normal distribution corresponds to a coverage probability of approximately 95%
- End of Certificate -

เอกสารไม่ควบคุม

FM-708-02 R01 1/1/2021

List of Instrument Certificates for Environmental Quality Analysis

No.	Instrument/Equipment	Parameter	Manufacturer	Model/Serial No.	Calibrator	Certification No.	Date of Calibration	Due date of Calibration*
1	Analytical Balance	PARTICULATE MATTER (PM10) TOTAL SUSPENDED PARTICULATE	Mettler Toledo	MS204TS/00 / C252436235	National Food Institute, Ministry of Industry, Thailand	2402420-003-01	19/4/2024	18/4/2025
2	Microbalance	PARTICULATE MATTER	Mettler Toledo	XP6 / B322373893	National Food Institute, Ministry of Industry, Thailand	2402420-002-01	19/4/2024	18/4/2025

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

Calibration Certificate

Certificate No.: 2402420-002-01
Client name: UNITED ANALYST AND ENGINEERING CONSULTANT CO., LTD.
Address: 3 Soi Udomsuk 41, Sukhumvit Road,
Bangchack, Prakhonong, Bangkok 10260

Page 1 of 3

Equipment: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: XP6

Serial No.: B322373893

ID No.: UAE.AIR.019/2556

Order No.: 2402420

Operation No.: 2402420-002

Date of Receipt: 19 April 2024

Date of Calibration: 19 April 2024

Calibrated by Mr.Pheraphat Tuanjit
Scientist

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

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.: 2402420-002-01
Equipment: Electronic Balance
Model: XP6
Serial No.: B322373893
Capacity: 6.1 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g
ID No.: UAE.AIR.019/2556

Page 2 of 3

Date of Calibration: 19 April 2024

Environment Condition: Ambient Temperature: 22.6 ± 1.8 °C Relative Humidity: 68 ± 6.0 %

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-PA-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	M03111815	28 November 2024
Standard Weight Class E2	1-500g	15882	TCS	M03111825	28 November 2024

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH 019/23	Quality Reborn	QR24 0492	4 March 2023

3. This certification is traceable to SI UNIT

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

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

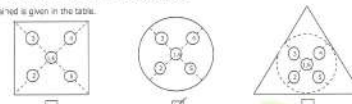
Calibration Results:

1. Repeatability of Reading:

Nominal Value (g)	Standard Deviation of Reading (g)
3	0.0000057
6	0.0000019

2. Off-Center Error:

A mass of 2 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)
1.999981	1.999983	1.999980	1.999984	1.999983	1.999981	0.000003

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

Calibration Report

Certificate No.: 2402420-002-01
Equipment: Electronic Balance
Model: XP6
Serial No.: B322373893
Capacity: 6.1 g
Manufacturer: METTLER TOLEDO
Resolution: 0.00001 g
ID No.: UAE.AIR.019/2556

Page 3 of 3

Date of Calibration: 19 April 2024

Calibration Results: (Continued)

Calibration Range: 0-6 g

Calibration Adjustment: Internal Calibration

3. Departure from Nominal Value:

Nominal Value	Standard Value	Average Reading	Correction	Uncertainty	Coverage Factor
(g)	(g)	(g)	(g)	(g)	#
Unloaded	0.0000000	0.0000000	0.0000000	0.0000032	2.00
0.01	0.0099975	0.0099999	-0.0000022	0.0000047	2.00
0.05	0.0500015	0.0500003	-0.0000012	0.0000048	2.00
0.10	0.1000010	0.1000001	-0.0000009	0.0000069	2.00
0.15	0.1500020	0.1500000	-0.0000020	0.0000083	2.00
0.17	0.1700050	0.1700006	-0.0000044	0.000012	2.00
0.20	0.1999990	0.2000002	-0.0000008	0.0000083	2.00
1.50	1.4999730	1.4999771	0.0000041	0.000027	2.00
3.00	2.9999680	2.9999559	0.0000121	0.000028	2.00
4.30	4.4999810	4.499987	0.000006	0.000022	2.00
6.00	5.9999480	5.999931	0.000017	0.000032	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

Calibration Certificate

Certificate No.: 2402420-003-01
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: Electronic Balance

Manufacturer: METTLER TOLEDO

Model: MS204TS/00

Serial No.: C252436235

ID No.: UAE.AIR.023/2556

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. Jaengkharnkit
(Miss Preeyaporn Jaengkharnkit)
Vice President, Department of Laboratory Services
Responsible for the Technical Management Team

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.: C25N36235
Capacity: 220 g
Manufacturer: METTLER TOLEDO
Resolution: 0.0001 g
ID No.: UAE.AIR.023/2566

Date of Calibration: 19 April 2024 **Page 2 of 3**

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-PM-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	13860	TCS	MC3111815	28 November 2024
Standard Weight Class E2	1-500g	13862	TCS	MC3111825	28 November 2024

Instrument	Model	Serial No.	Calibrated By	Certificate No.	Due Date
Thermo-Hygro Meter	608-H1	NFI.BTH.019/23	Quality Rubann	QED4-0492	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.

<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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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
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F-CS-012 Revision: 01 Date: 20-04-65



Calibration Report

Certificate No.: 2402420-003-01
Equipment: Electronic Balance
Model: MS204TS/00
Serial No.: C25N36235
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 (A g)	Coverage Factor
Unloaded	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	-0.0012	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

