

ภาคผนวก ค : เอกสารสอบเทียบความถูกต้อง
ของเครื่องมือเก็บตัวอย่าง

ANALYTICAL BALANCE

Model : MS204TS/00

Serial No. : B904136539

Mettler-Toledo (Thailand) Ltd.
846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District
Bangna District, Bangkok 10260
+66 2723 0382
MT-TH.ServiceSupport@mt.com



NSC-TISI-TIS 17025
CALIBRATION 0062

Accuracy Calibration Certificate

Customer

Company: EASTERN THAI CONSULTING 1992 CO., LTD.
Address: 683 Moo 11, Sukhaphiban 8 Rd., Nong Kham
City: Sriracha
Zip / Postal: 20230
State / Province: Chonburi
Order Number: 033266880

Contact: Sasiporn N.

Weighing Device

Manufacturer: Mettler Toledo
Model: MS204TS/00
Serial No.: B904136539
Building: Laboratory
Floor: 1
Room: Balance

Instrument Type: Weighing Instrument
Asset Number: LABE 05/4
Terminal Model: N/A
Terminal Serial No.: N/A
Terminal Asset No.: N/A

Range	Max. Capacity	Readability (d)
1	220 g	0.0001 g

Procedure

Calibration Guidelines: EURAMET cg-18 v 4.0 (11/2015)
Mettler Toledo Work Instruction: CP/W002/20

This calibration certificate contains measurements for As Found and As Left calibrations.
The sensitivity/span of the weighing instrument was adjusted before As Found and As Left calibrations with a built-in weight.
In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature		Humidity	
	As Found	As Left	As Found	As Left
	Start: 23.4 °C	End: 23.4 °C	Start: 50.6 %	End: 50.6 %
	Start: 23.8 °C	End: 23.4 °C	Start: 51.8 %	End: 51.2 %

As Found Calibration Date: 05-Feb-2024
As Left Calibration Date: 05-Feb-2024
Issue Date: 05-Feb-2024

Calibrator: Sathaporn T.
Sathaporn Talsen
Approved Signatory: [Signature]

Technical Manager / Head of Calibration Center

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Measurement Results

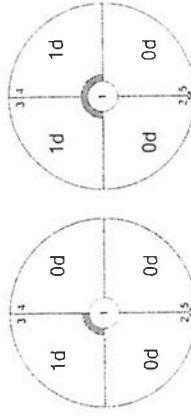
Repeatability

Test Load: 100 g		As Found	As Left
1	99.9996 g	100.0001 g	As Found
2	99.9997 g	100.0001 g	As Left
3	99.9997 g	100.0000 g	As Found
4	99.9996 g	100.0001 g	As Left
5	99.9997 g	100.0001 g	As Found
6	99.9996 g	100.0000 g	As Left
7	99.9997 g	100.0001 g	As Found
8	99.9996 g	100.0000 g	As Left
9	99.9996 g	100.0001 g	As Found
10	99.9996 g	100.0001 g	As Left
Standard Deviation		0.00005 g	0.00005 g

The "d" in the graph represents the readability of the range/interval in which the test was performed.
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g		As Found	As Left
1	99.9996 g	100.0000 g	As Found
2	99.9996 g	100.0000 g	As Left
3	99.9997 g	100.0001 g	As Found
4	99.9996 g	100.0001 g	As Left
5	99.9996 g	100.0000 g	As Found
Maximum Deviation		0.0001 g	0.0001 g



The "d" in the graph represents the readability of the range/interval in which the test was performed.

Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.12 mg	2
2	0.0100 g	0.0100 g	0.0000 g	0.13 mg	2
3	0.0500 g	0.0499 g	-0.0001 g	0.13 mg	2
4	0.1000 g	0.0999 g	-0.0001 g	0.13 mg	2
5	1.0000 g	0.9998 g	-0.0002 g	0.13 mg	2
6	5.0000 g	4.9999 g	-0.0001 g	0.14 mg	2
7	10.0000 g	9.9999 g	-0.0001 g	0.14 mg	2
8	50.0000 g	49.9997 g	-0.0003 g	0.16 mg	2
9	100.0000 g	99.9995 g	-0.0005 g	0.20 mg	2
10 ¹	149.9999 g	149.9993 g	-0.0006 g	0.31 mg	2
11 ¹	199.9998 g	199.9990 g	-0.0008 g	0.35 mg	2

As Left

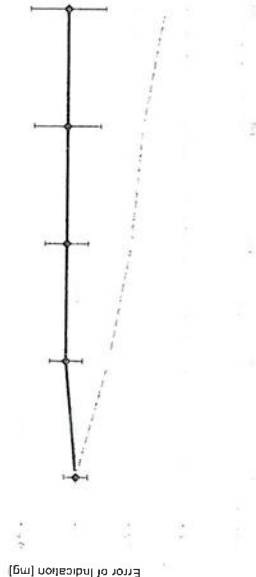
Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.11 mg	2
2	0.0100 g	0.0100 g	0.13 mg	2
3	0.0500 g	0.0500 g	0.13 mg	2
4	0.1000 g	0.1000 g	0.13 mg	2
5	1.0000 g	1.0001 g	0.0001 g	2
6	5.0000 g	5.0000 g	0.0000 g	2
7	10.0000 g	10.0001 g	0.0001 g	2
8	50.0000 g	50.0001 g	0.0001 g	2
9 ¹	100.0000 g	100.0001 g	0.0001 g	2
10 ¹	149.9999 g	150.0000 g	0.0001 g	2
11 ¹	199.9998 g	199.9999 g	0.0001 g	2

¹The calculated uncertainty was replaced by the CMC (Calibration and Measurement Capabilities) value because the calculated uncertainty was smaller than the CMC value.

As Found

As Left

For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.



Calibration Points [g]

The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor $k=2$, which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The results of this calibration certificate relate only to the calibrated item.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.: WS32
Certificate Number: 188109
Date of Issue: 25-Sep-2023
Calibration Due Date: 25-Mar-2025

Weight Set 2: OIML E2

Weight Set No.: WS85
Certificate Number: 188113
Date of Issue: 27-Sep-2023
Calibration Due Date: 26-Mar-2025

Thermo Baro Hygrometer

Equipment No.: IN74
Certificate Number: SG-H-00418/66
Date of Issue: 19-May-2023
Calibration Due Date: 18-May-2024

Remarks

FACT adjustment functionality activated

Equipment condition: Good

Next calibration according to customer's procedure

Calibration data not decide by calibration laboratory

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with k=2 in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: 1.5 · 10⁻⁵ / K

Temperature range on site for the evaluation of the measurement uncertainty in use: 5 K

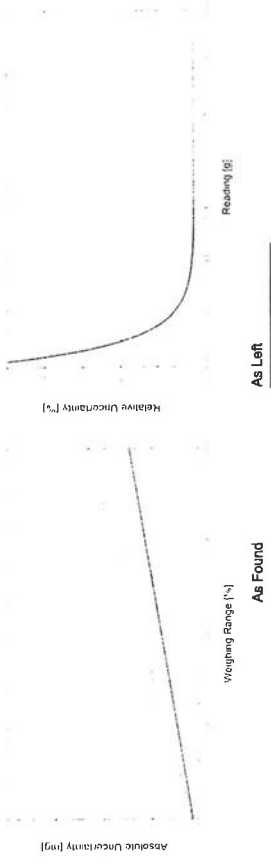
Linearization of Uncertainty Equation

	Range		Max	As Found	As Left
	d				
1	0.0001 g	220 g		$U_1 = 0.13 \text{ mg} + 0.0101 \text{ mg/g} \cdot R$	$U_1 = 0.13 \text{ mg} + 0.00616 \text{ mg/g} \cdot R$

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found	As Left
0.0220 g	0.13 mg	0.59%
0.2200 g	0.13 mg	0.060%
2.2000 g	0.15 mg	0.0069%
22.0000 g	0.35 mg	0.0016%
220.0000 g	2.4 mg	0.0011%



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GWP® Certificate

As Found ✓

As Left ✓

The weighing device meets the given process requirements.

The weighing device meets the given process requirements.

Tests Performed:

As Found

As Left

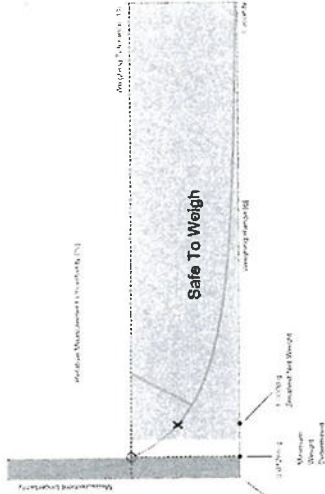
Process Requirements

Weighing Tolerance: 1 %

Smallest Net Weight: 1.0000 g

Safety Factor: 2

Safe Weighing Range



While the values in this graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. This graph reflects As Left testing, unless only As Found was performed.

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Minimum Weight

As Found Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Safety Factor					
Tolerance	1	2	3	5	10
0.1%	0.13300 g	0.26873 g	0.40728 g	0.69320 g	1.46405 g
0.2%	0.06616 g	0.13300 g	0.20051 g	0.33764 g	0.69320 g
0.5%	0.02638 g	0.05288 g	0.07947 g	0.13300 g	0.26873 g
1%	0.01318 g	0.02638 g	0.03962 g	0.06616 g	0.13300 g
2%	0.00659 g	0.01318 g	0.01978 g	0.03300 g	0.06616 g
5%	0.00263 g	0.00527 g	0.00790 g	0.01318 g	0.02638 g

Pass: The determined minimum weight meets the requirement for the smallest net weight.

As Left Minimum Weight Table

Minimum weights for different weighing tolerances and safety factors					
Safety Factor					
Tolerance	1	2	3	5	10
0.1%	0.12728 g	0.25614 g	0.38652 g	0.65256 g	1.34797 g
0.2%	0.06344 g	0.12728 g	0.19151 g	0.32118 g	0.65256 g
0.5%	0.02533 g	0.05072 g	0.07618 g	0.12728 g	0.25614 g
1%	0.01266 g	0.02533 g	0.03802 g	0.06344 g	0.12728 g
2%	0.00633 g	0.01266 g	0.01899 g	0.03167 g	0.06344 g
5%	0.00253 g	0.00506 g	0.00759 g	0.01266 g	0.02533 g

Pass: The determined minimum weight meets the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with $k = 2$ and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor. As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

Notes on minimum weight values in above table:

- If "N/A" is shown above, no appropriate value could be calculated.
- METTLER TOLEDO is not responsible for the definition of the process requirements.

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Measurement Results

Results Summary

Repeatability		Eccentricity		Error of Indication	
As Found	✓	As Found	✓	As Found	✓
As Left	✓	As Left	✓	As Left	✓

✓ = Passed
✗ = Failed
N/A = Safety Factor not met

Repeatability

Test Load: 100 g

Tolerance		Control Limit		As Found		As Left	
				Std. Deviation	Result	Std. Deviation	Result
0.1%	0.00050 g	0.00050 g	✓				✓
0.2%	0.00100 g	0.00100 g	✓				✓
0.5%	0.00250 g	0.00250 g	✓				✓
1%	0.00500 g	0.00500 g	✓	0.00005 g		0.00005 g	✓
2%	0.01000 g	0.01000 g	✓				✓
5%	0.02500 g	0.02500 g	✓				✓

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

Eccentricity

Test Load: 100 g

Tolerance		Control Limit		As Found		As Left	
				Deviation	Result	Deviation	Result
0.1%	0.0500 g	0.0500 g	✓				✓
0.2%	0.1000 g	0.1000 g	✓				✓
0.5%	0.2500 g	0.2500 g	✓	0.0001 g		0.0001 g	✓
1%	0.5000 g	0.5000 g	✓				✓
2%	1.0000 g	1.0000 g	✓				✓
5%	2.5000 g	2.5000 g	✓				✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

Error of Indication

As Found

		Control limits for various weighing tolerances							
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%		
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A		
50.0000 g	-0.0003 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g		
100.0000 g	-0.0005 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g		
149.9999 g	-0.0006 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g		
199.9998 g	-0.0008 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g		
Result		✓	✓	✓	✓	✓	✓		

As Left

		Control limits for various weighing tolerances							
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%		
0.0000 g	0.0000 g	N/A	N/A	N/A	N/A	N/A	N/A		
50.0000 g	0.0001 g	0.0250 g	0.0500 g	0.1250 g	0.2500 g	0.5000 g	1.2500 g		
100.0000 g	0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g		
149.9999 g	0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g		
199.9998 g	0.0001 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g		
Result		✓	✓	✓	✓	✓	✓		

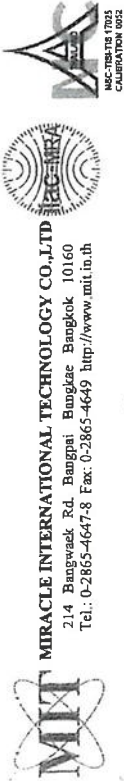
The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.

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BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD.
214 Bangwaek Rd. Bangnai Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.miti.co.th>



CALIBRATION CERTIFICATE

Certificate No. : L202405022-0013
Date Issued : 08-May-24

Customer : Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Analog Barometer

Manufacturer : Barigo
Model : -
Serial No. : -
ID No./Tag No. : BM001/41
Date Received : 03-May-24
Date Calibrated : 06-May-24

Calibrated by : Mr. Saruth Srihuikul

Calibration Method or Calibration Procedure Used

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

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

Result of Calibration

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

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

Approved by: *Sasayuth T.*
(Mr. Sasayuth Tochua)

Page 1 of 2

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Certificate No : L202405022-0013

Environment Ambient Temperature : (25 ± 2)°C
Relative Humidity : (50 ± 15)%RH

STD Reading	UUC Reading (mbar)		UUC Reading (mbar)		UUC Error	Uncertainty		MPE	Pass / Fail
	mbar	Before Adjusted	After Adjusted	mbar		± mbar	± mbar		
990.00	990	-	-	0.00	0.59	10.3	10.3	Pass	Pass
1000.00	1000	-	-	0.00	0.59	10.3	10.3	Pass	Pass
1010.00	1010	-	-	0.00	0.59	10.3	10.3	Pass	Pass
1020.00	1020	-	-	0.00	0.59	10.3	10.3	Pass	Pass
1030.00	1030	-	-	0.00	0.59	10.3	10.3	Pass	Pass

STD = Standard Pass = $|\text{error}| + |\text{uncertainty}| \leq [\text{MPE}]$

UUC = Unit Under Calibration Fail = $|\text{error}| + |\text{uncertainty}| > [\text{MPE}]$

MPE = Maximum Permissible Error

Calibrated condition : Pressure Medium Air : Density = 1.19 kg/m³ @ 20°C, 1 bar
Mounting Position Vertical
Reference Level at center of its dial
Conversion Factor Multiply by 1.0 E+02 - Pa unit

Description of UUC :	Range	950 - 1080	mbar Absolute
	Calibration Range	990 - 1030	mbar Absolute
	Scale Interval	1	mbar

Condition As-Received : Used Item
The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through
IRPC Certificate No. CL1-P250097 for Reference Pressure Monitor Serial No. 1598, Due 09-Nov-24

End of Certificate



Page 2 of 2

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Hot Air Oven

Model : UFE 500

Serial No. : G511.0182

CERTIFICATE OF CALIBRATION

Page 1 of 3

Certificate No. : 23-148804

Sample Code : 23-56200-006

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapibarn 8 Rd., Nongkham,

Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.

(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert

Model : UFE 500

ID No. : LABE 17/4

Date of Receipt : 22 December 2023

Date of Calibration : 22 December 2023

Condition of Calibration

1. Environment
- | | | | | |
|---------------------------|-----------|-----------|-----------|-----------|
| 1.1 Ambient temperature | : Maximum | 30.9 °C | : Minimum | 29.6 °C |
| 1.2 Relative humidity | : Maximum | 54.5 % | : Minimum | 46.8 % |
| 1.3 Line voltage supplied | : Maximum | 227.6 VAC | : Minimum | 224.2 VAC |

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-P1100)	LB-DA-08 (RTD-248 to RTD-256)	23-084070	06 August 2024

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by

Mr. Pisek Into

Approved by

(Mr. Sornchai Neampunt)

Scientist

Signed for Director

Issue date

25 December 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC)

361 Soi Ladprao 122, Ladprao Road,

Phlabphla, Wang Thonglang, Bangkok 10310

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Rev 01

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date 15/10/21

REPORT OF CALIBRATION

Page 2 of 3

Certificate No. : 23-148804

Sample Code : 23-56200-006

Results of Calibration

Resolution : 0.5 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)										Uncertainty ± (°C)	Coverage factor k
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	# 10		
104	103.5	103.5	104.11	103.94	103.85	103.84	103.97	103.93	103.64	103.51	104.23	104.23	0.47	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
104	0.04	0.78	0.81

Notes

UUC* = Unit Under Calibration



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REPORT OF CALIBRATION

Page 3 of 3

Certificate No. : 23-148804

Sample Code : 23-56200-006

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 56 cm ; D = 40 cm ; H = 48 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes " Stability of chamber and loading effect in chamber at 20% of uniformity "
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

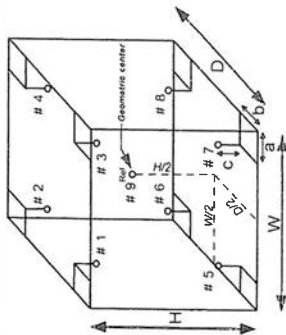


Figure: Example of sensor installation Positions

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M0003.

- End of Report -

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ICP-OES/Avio550
Serial No. : M81S2210101

ICP-OES/Avio550 Preventive Maintenance (PM)

Company Name:		Eastern Thai Consulting 1992 Co., Ltd.	
Address (Instrument Location):		683 Moo 11 Sukhapibarn 8 Rd.,Siracha, Chon Buri 20230	
Serial Number:	M8152210101	PM Number:	1 OF 2 W
Customer Name (if applicable):	K.Nunnaphat	Telephone Number:	038 481 197
Service Engineer Name:	K.Piyawit	Service Order Number:	WO-02754304
Date PM Performed: (DD-MMM-YYYY)	25-Apr-2024	Next PM Due Date: (DD-MMM-YYYY)	25-Oct-2024
Standard Labor Hours to Complete PM :		4 hours	

Part Number	Release	Publication Date
TH09370188 Rev.2	B	July 2020

Scope
The purpose of this PM is to ensure the continued functionality of the PerkinElmer / Avio550 by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

General Instructions:
The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.
Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
Avio550Max	M8152210101	Syngistix 5.1.0.0293

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
0995098	Air Filter-Spectrometer	N/A
N077520	Air Filter-RF Generator	N/A
0992731	Axial Window	N/A
B0810377	Radial Window	N/A
N0770438	O-ring kit, injector support adapter	N/A
N0780437	O-ring kit, torch	N/A

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N0691579	Multi-Element Standard	AR	61-176CRX1	30-JUN-2025
N9300221	DL Standard diluted 100 X	AR	59-091CRY1	30-JUN-2024
N0582152	Wave Cal Solution	AR	59-150CRX1	30-SEP-2024
N9302946	V/S Wavecal Solution	AR	59-113CRT1	28-FEB-2025

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Ask customer about unit's performance since last visit.
- ☒ Check incoming AC line voltage under load for proper levels and grounding.
- ☒ Is the instrument operational? If not, please comment.

2. Mechanical:

- ☒ Inspect and clean all fans and filters.
- ☒ Inspect and replace torch components and necessary.
 - Torch Components Replaced: ☐ Yes ☒ No
 - Tubing Replaced: ☒ Yes ☐ No
- ☒ Inspect all tubing for signs of cracking or leaking and replace as necessary.
- ☒ Inspect the peristaltic pump for proper operation.
- ☒ Check and adjust if necessary, the external nitrogen, argon shear gas and water supply pressures.
- ☒ Check and adjust if necessary, the internal nitrogen, main argon, torch argon and shear gas pressures.

Regulator	Measured Pressure	Set Pressure
Nitrogen		NA (calibrated in Factory)
Main Argon	76 psig	76 psig
Torch Argon	67 psig	67 psig
Shear Gas	65 psig	65 psig
Water	35 psig	35 psig

- ☒ Check shear gas nozzle for blockages and proper, uniform flow.
- ☒ Inspect nitrogen Hi/Low purge and shear gas solenoids for proper function.
- ☒ Inspect the function of all spectrometer motors. Drive the motors from the Spectrometer DCM. (slits, XY motor)
- ☒ Inspect the function of the pneumatic shutter for proper operation.
- ☒ Perform preventative maintenance on the chiller as required. Make the customer aware of the importance of maintaining the chiller fluid level and filter replacement.
- ☒ Drain air compressor surge tank.
- ☒ Clean exterior of instrument.
- ☒ Visually inspect all PC boards for cleanliness and signs of corrosion.

3. Electrical

- ☒ Check all RF generator and spectrometer power supply voltages.
- ☒ Run instrument diagnostic checks from the appropriate Device Control Module.

RF Generator:

- ☒ Check the RF generator status screens.
- ☒ Check the function of all interlocks.

Spectrometer:

- ☒ Check the spectrometer status screens. Ensure Ready mode with no fetal errors.
- ☒ Check the spectrometer optical tub temperatures (top, bottom, fin, optical base).
- ☒ Check detector temperatures.
- ☒ Check TEC voltages (6.5VDC)

4. Optical:

- ☒ Clean or replace the axial and radial view windows as necessary.
 - Axial Window Replaced: ☐ Yes ☒ No
 - Radial Window Replaced: ☐ Yes ☒ No

5. PM Performance Tests:

- ☒ Perform View Align.

Test Spectral Resolution:

- ☒ Measure the spectrometers ability to separate two adjacent wavelengths.

Parameter	Specification	Test Result	Pass/Fail
As 193.696 - Resolution	≤0.007	0.00534	Passed
Ni 231.604 - Resolution	≤0.008	0.00725	Passed
Ni 341.476 - Resolution	≤0.012	0.00891	Passed
La 408.672 - Resolution	≤0.020	0.01603	Passed
Ba 455.403 - Resolution	≤0.025	0.02190	Passed

Test Precision:

- ☒ Test for reproducibility of a set of measurement.

Parameter	Specification	Test Result	Pass/Fail
As 193.696	%RSD ≤ 1 %	0.65%	Passed
Zn 213.856	%RSD ≤ 1 %	0.66%	Passed
Mn 257.610	%RSD ≤ 1 %	0.41%	Passed
La 379.478	%RSD ≤ 1 %	0.51%	Passed
Ba 455.403	%RSD ≤ 1 %	0.32%	Passed
Ba 493.408	%RSD ≤ 1 %	0.30%	Passed

☒ Run an Axial & Radial BEC according to the A&T spec.

Test Axial BEC Cd:

Method "BEC-XL" For Samples "IB (2%HNO3)" and "IS (N930-0221/100)", record intensities.

Calculated BEC: BEC = (IB * Conc of Std) / (IS - IB). Where Conc of Std = 500 PPB

Element	Conc.	IB	IS	Pass/Fail
Cd 226	500	2,028.9	162,248.4	
IB*Conc	IS-IB	BEC	Spec	
1,014,450	160,219.5	6.33	<150 PPB	Passed

Test Radial BEC Mn:

Method "BEC-RL" For Samples "IB (2%HNO3)" and "IS (N069-1579)", record intensities.

Calculated BEC: BEC = (IB * Conc of Std) / (IS - IB). Where Conc of Std = 1,000 PPB

Element	Conc.	IB	IS	Pass/Fail
Mn 257	1,000	2,166.8	91,410.0	
IB*Conc	IS-IB	BEC	Spec	
2,166,800	89,243.2	24.28	<45 PPB	Passed

6. Review:

- ☒ Review with the customer PM work performed.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for ICP-OES/Avio550 have been completed.

This ICP-OES/Avio550 Passes ☒ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:

Date:

25-Apr-2024
(DD-MM-YYYY)

Authorized Customer Representative:

Date:

25-Apr-2024
(DD-MM-YYYY)

COPY

IC-THERMO

Serial No. : 20053176

Certificate of Calibration
Integriion RFIC: Anion and Cation (ID#9960)

ORIFICE TRANSFER STANDARD CERTIFICATION

WORKSHEET TE-5025A

ROOTSMETER S/N 0438320



TISCH ENVIRONMENTAL, INC.
145 SOUTH MIAMI AVE
VILLAGE OF CLEVELAND, OH
45002
513.467.9000
877.263.7810 TOLL FREE
513.467.9009 FAX

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Mar 24, 2016 Rootmeter S/N 0438320 Ta (K) - 295
Operator Tisch Orifice I.D. - 0136 Pa (mm) - 742.95

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORIFICE DIFF H2O (in.)
1	NA	NA	1.00	1.3400	3.2	2.00
2	NA	NA	1.00	0.9510	6.3	4.00
3	NA	NA	1.00	0.8510	7.8	5.00
4	NA	NA	1.00	0.8130	8.6	5.50
5	NA	NA	1.00	0.6690	12.6	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9832	0.7337	1.4054	0.9957	0.7430	0.8911
0.9791	1.0296	1.9875	0.9913	1.0426	1.2603
0.9770	1.1481	2.2221	0.9894	1.1626	1.4090
0.9760	1.2006	2.3305	0.9884	1.2157	1.4778
0.9707	1.4510	2.8107	0.9830	1.4694	1.7823
Qstd slope (m)	1.96262		Qa slope (m)	1.22896	
intercept (b)	-0.03249		intercept (b)	-0.02060	
coefficient (r)	0.99993		coefficient (r)	0.99993	
y axis = SQRT[H2O(Pa/760) (298/Ta)]					
y axis = SQRT[H2O(Ta/Pa)]					

CALCULATIONS

Vstd = Diff. Vol [(Pa-Diff. Hg)/760] (298/Ta)
Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa]
Qa = Va/Time

For subsequent flow rate calculations:

Qstd = 1/m{[SQRT(H2O(Pa/760) (298/Ta))] - b}
Qa = 1/m{[SQRT H2O(Ta/Pa)] - b}

2009

Primary Flow Calibrator
Serial No. : 110619 , 207510

Certificate of Calibration

Customer
Name : Eastern Thai Consulting 1992 Co., Ltd.
Address : 683 Moo 11, Sukhapibam 8 Rd., Nongkham, Sriracha, Chonburi 20230

Certificate No : 24-AFM-023
Request No : Req-2024-0095

Unit Under Calibration Details

Measurement Item : Primary Flow Calibrator
Manufacturer : Bios
Model : Defender 510-L
Serial Number : 110619
ID : -
Sensor Model : -
Sensor Serial Number : -

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : 23 °C ± 3 °C
Humidity : 55 %RH ± 20 %RH1
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 11 January 2024
Calibration Date : 30 January 2024

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator


Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qreborn	27 February 2024
Pressure meter	CPG2400	41100KDLU651882	TPA	9 November 2024


Traceability :

This Certificate is traceable to SI Unit through Sensidyne A2LA Accreditation No. 1943 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. Noppadon Luangrui
Service Calibration Engineer

Approved By : 
Mr. Paci Mathavorn
Calibration Engineer Supervisor
Issue Date : 30 January 2024

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UDC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
24.80	101.23	0	0.00	0.0000	0.0058
24.40	101.18	50	49.629	-0.4	3.3
24.40	101.16	100	100.73	0.7	2.8
24.30	101.13	200	198.30	-1.7	5.6
24.30	101.10	300	298.14	-1.9	8.4
24.40	101.06	400	397.45	-3	11
24.20	101.00	500	496.93	-3.1	7.1

Note
STD : Standard UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition
- 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

• Indicates non accredited

End of Certificate

COPY

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Certificate of Calibration

Customer
Name : Eastern Thai Consulting 1992 Co., Ltd.
Address : 683 Moo 11, Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Unit Under Calibration Details

Measurement Item	: Primary Flow Calibrator	
Manufacturer	: MettLabs	
Model	: Defender S10-M	Sensor Model : -
Serial Number	: 207510	Sensor Serial Number : -
ID	: -	

Location of Calibration : LAB 4 AIR VELOCITY METER

Calibration Environment and Details

Temperature : $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$
Humidity : $55\% \text{RH} \pm 20\% \text{RH}$
Barometric Pressure : $1013 \text{ hPa} \pm 10 \text{ hPa}$

Received Date	: 11 January 2024
Calibration Date	: 30 January 2024

2 Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	080000057	Qreborn	27 February 2024
Pressure meter	CPG2400	41000KDU/651882	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 : mpg Mr. Noppadon Luangart
Service Calibration Engineer

Approved By : phk Mr. Pait Mathavoin
Calibration Engineer Supervisor

Issue Date : 30 January 2024

2025 COPY

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 01 Issue date 25/01/24

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
24.80	101.23	0	0.00	0.0000	0.0058
24.70	101.58	101	101.48	0.5	2.8
24.80	101.50	200	201.14	1.1	5.6
24.70	101.50	500	503.87	3.9	7.1
24.80	101.50	1003	1010.1	7	14
24.70	101.60	2002	2014.6	13	29
24.60	101.33	2995	3007.6	13	43
24.60	101.65	4027	4007.5	-19	57
24.50	101.70	5035	5010.7	-24	72

Note: STD = Standard deviation

Note	STD : Standard	UUC : Unit Under Calibration
------	----------------	------------------------------

- UUC Reference Condition : At atmospheric pressure and room temperature condition
- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{\text{meas}} = Q_{\text{ref}} \chi \frac{P_{\text{ref}}}{P_{\text{meas}}} \frac{T_{\text{meas}}}{T_{\text{ref}}}$$

where Q = Flow Rate
 P = Absolute Pressure
 T = Absolute Temperature
 μ = Measurement Condition
 μ_r = Standard Condition

* Indicates non accredited

End of Certificate

100

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 01 Issue date 25/01/24

THERMO-HYGROMETER

Model : 608-H1

Serial No. : 45106737



CERTIFICATE OF CALIBRATION

Page 1 of 2

Certificate No. : 24-062442

Sample Code : 24-25546-002

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Siracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration laboratory)

Equipment : Digital thermo-hygrometer

Manufacturer : testo Model : 608-H1

Serial No. : 45106737 ID No. : LABE 09/7

Date of Receipt : 23 May 2024 Date of Calibration : 27-28 May 2024

Condition of Calibration

1. Environment
- 1.1 Ambient temperature : $23.0\text{ }^{\circ}\text{C} \pm 3.0\text{ }^{\circ}\text{C}$
- 1.2 Relative humidity : $55.0\text{ \%} \pm 15.0\text{ \%}$

2. Calibration method

- 2.1 In-house method: WI-CL-045 By comparison with thermometer standard / chilled mirror hygrometer in controlled chamber.
- 2.2 The calibration by comparison unit under calibration (UUC) to the thermometer standard / chilled mirror hygrometer in a chamber at the controlled temperature / relative humidity.

3. Reference standard instrument

Instrument	Model	ID No.	Certificate No.	Due Date
3.1 Chilled Mirror	Optidew 401	LB-DP-03 & LB-DP-03 (DP)	TH-0064-23	07 August 2024
3.2 Digital Thermometer	Optidew 401	LB-DP-03 & LB-DP-03 (Temp.)	23-103423	03 September 2024
3.3 Digital Thermometer	34972A	LB-DA-07 with RTD-89	23-101374	05 September 2024

4. This certificate is traceable to the international system of unit (SI Unit).

- 4.1 Instrument No. 3.1 through National Institute of Metrology (Thailand).
- 4.2 Instrument No. 3.2 and 3.3 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.
5. This result of calibration was found accurate as shown on date and place of calibration only.
6. Condition of calibration item : Normal

Calibrated by : Miss Pornsuda Lohabai

Scientist

30 May 2024

(Mr. Somchai Neampunt)

Signed for Director

Issue date

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladprao 122, Ladprao Road,

Phlabphla, Wang Thonglang, Bangkok 10310

FM-CL-114

TEL 02-516-2422

FAX 02-516-6949

Rev 01

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date 15/10/21



REPORT OF CALIBRATION

Page 2 of 2

Certificate No. : 24-062442

Sample Code : 24-25546-002

Results of Calibration

Temperature measurement

Resolution : $0.1\text{ }^{\circ}\text{C}$

Range : $0\text{ }^{\circ}\text{C}$ to $50\text{ }^{\circ}\text{C}$

Calibration point $^{\circ}\text{C}$	Average of standard reading		Unit under calibration		Expanded uncertainty $^{\circ}\text{C}$
	Controlled humidity %RH	Temperature $^{\circ}\text{C}$	Average reading $^{\circ}\text{C}$	Correction value $^{\circ}\text{C}$	
20	50	20.00	20.1	- 0.10	± 0.39
25	50	25.00	25.0	0.00	± 0.39
30	50	30.00	29.9	+ 0.10	± 0.39

Humidity measurement

Resolution : 0.1 \%RH

Range : 10 \%RH to 95 \%RH

Calibration point %RH	Average of standard reading		Unit under calibration		Expanded uncertainty %RH
	Air temperature $^{\circ}\text{C}$	Calculated humidity %RH	Average reading %RH	Correction value %RH	
45	25.02	45.10	48.4	- 3.30	± 1.3
60	25.01	60.07	63.4	- 3.33	± 1.5
75	25.01	75.15	78.5	- 3.35	± 1.7

Notes

Calibration results without adjustment.

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

(Mr. Somchai Neampunt)

Signed for Director

Issue date

30 May 2024

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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Rev 01

361 Soi Ladprao 122, Ladprao Road,

Phlabphla, Wang Thonglang, Bangkok 10310

FM-CL-016

TEL 02-516-2422

FAX 02-516-6949

Rev 09

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date 15/10/21

CERTIFICATE OF ANALYSIS

EPA PROTOCOL GAS

Cylinder No. : EB0062815

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15ACX9C Reference Number: 82-401135335-1
Cylinder Number: EB0062815 Cylinder Volume: 144.4 CF
Laboratory: 124 - Riverton (SAP) - NJ Cylinder Pressure: 2015 PSIG
PGVP Number: B52018 Valve Outlet: 680
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Mar 13, 2018
Expiration Date: Mar 13, 2026

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology 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 volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Assay Dates
NOX	50.00 PPM	50.55 PPM	G1	03/06/2018, 03/13/2018
NITRIC OXIDE	50.00 PPM	50.50 PPM	G1	03/06/2018, 03/13/2018
SULFUR DIOXIDE	50.00 PPM	51.01 PPM	G1	03/06/2018, 03/13/2018
CARBON MONOXIDE	2000 PPM	1977 PPM	G1	03/06/2018
NITROGEN	Balance			

CALIBRATION STANDARDS			
Type	Lot ID	Cylinder No	Expiration Date
NITRM	16060607	CC442564	Jun 27, 2020
PRM	12367	APEX1099237	Jun 02, 2017
ISMIS	0315201604	CC503356	Mar 15, 2019
NITRM	16011025	CC473218	Jun 07, 2022
NITRM	12060735	CC356192	Dec 14, 2026

The SRM, 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 6700 APW1100391 CO	FTIR	Feb 08, 2018
Nicolet 6700 APW1100391 NO	FTIR	Feb 15, 2018
Nicolet 6700 APW1100391 NO2	FTIR	Feb 16, 2018
Nicolet 6700 APW1100391 SO2	FTIR	Mar 01, 2018

Triad Data Available Upon Request

NOTES: NET WEIGHT: 10.43lbs
GROSS WEIGHT: 60.93lbs
PO# 5218000763

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2000 and relate only to items identified on this certificate. All items are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall not be reproduced in full without written approval of the issuer.



TESTING CERT No. 3082.05

Don Morris
Approved for Release

ANALYTICAL BALANCE (DU)

Model : XS205DU

Serial No. : 1126323724



Certificate No. : 23-148799

Sample Code : 23-56200-001

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by : Mr. Somwang Sangdee
Scientist
Approved by : (Mr. Somchai Neampunt)
Signed for Director

Issue date : 25 December 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 23-148799

Sample Code : 23-56200-001

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE
Manufacturer : METTLER TOLEDO
Model : XS205DU
Capacity : Max 81 g / 220 g
Resolution : 0.01 mg / 0.1 mg
Serial No. : 1126323724
ID No. : LABE 05/1

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 80	<input checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	40 80 40 80	
<input checked="" type="checkbox"/> Adjustment	Standard weight	40.000054 80.000048 40.000054 80.000048	80.000054 80.000048
	Average reading of indicator	40.000026 80.000037 40.000017 80.000017	80.000017 80.000017
	Standard deviation	0.000015 0.000016 0.000008 0.000009	0.000008 0.000009

Unit : g	Range : 200	<input checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100 200	
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042 200.000041	200.000041 200.000041
	Average reading of indicator	100.00003 200.00004 100.00001 200.00001	200.00001 200.00001
	Standard deviation	0.000005 0.000005 0.000003 0.000003	0.000003 0.000003

COPY



Certificate No. : 23-148799

Sample Code : 23-56200-001

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Range : 80 200

Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	1.00748	0	1.0274
40	0.98753	100	0.9975
80	0.99751	200	0.9975

3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.0000000	0.00000	0.00000	0.000012	2.05
0.01	0.0100025	0.01000	0.00000	0.000012	2.05
0.1	0.1000019	0.10001	-0.00001	0.000013	2.03
1	1.0000125	1.00001	0.00000	0.000015	2.02
5	5.0000208	5.00004	-0.00002	0.000021	2.00
10	10.000004	10.00008	-0.00008	0.000026	2.00
20	20.000030	20.00011	-0.00008	0.000036	2.00
50	50.000014	50.00014	-0.00013	0.000068	2.00
100	100.000042	100.0001	-0.0001	0.00016	2.00
150	150.000056	150.0001	0.0000	0.00022	2.00
200	200.000041	200.0002	-0.0002	0.00027	2.00

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003



Certificate No. : 23-148799

Sample Code : 23-56200-001

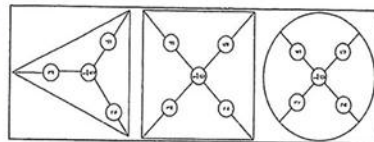
REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Weighing pan ☐ Circle ☐ Triangular ☒ Rectangular
Test weight : 50 and 100
Unit : g



Range 80 200

Position	Reading of indicator	Reading of indicator
1	50.00015	100.00001
2	50.00022	100.00001
3	50.00008	100.00001
4	50.00002	100.00000
5	50.00016	100.00002
6	50.00014	100.00001
Maximum difference	0.00013	0.0001

Condition of Calibration

1. Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019

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

3. Condition of Calibration item: Normal

4. This certification is traceable to the International System of Unit maintained at : -
Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (instrument number 1).

5. Reference standard instrument :

Instrument
1) STANDARD WEIGHT 1 mg to 1 kg

Class E2
ID.No. LB-WE-79

Certificate No. 23-105642
Due Date 10 September 2024

- End of Report -

6. Ambient conditions	Min	Max
Temperature (°C)	22.8	23.0
Relative Humidity (%Rh)	43.5	51.1
Air pressure (hPa)	1012.5	1014.5

361 Soi Ladprao 122, Ladprao Road,
Phlabphla, Wang Thonglang, Bangkok 10310
FM-CL-064

CERTIFICATE OF ANALYSIS

EPA PROTOCOL GAS

Cylinder No. : EB0145030

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E03N199E15AC0U4
Cylinder Number: EB0145030
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12021
Gas Code: CH4, PPN, BALN
Reference Number: 160-40224242-1
Cylinder Volume: 144.4 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 350
Certification Date: Oct 15, 2021
Expiration Date: Oct 15, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 000FR-12/01, using the assay procedures listed. Analytical Methodology does not require a section 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 would affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

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
METHANE	180.0 PPM	177.0 PPM	G1	+/- 1.0% NIST Traceable	10/15/2021
PROPANE	185.0 PPM	187.0 PPM	G1	+/- 1.0% NIST Traceable	10/15/2021
NITROGEN	Balance				
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
QNTRM	08011503	K002564	246.7 PPM METHANE/AIR	+/- 0.6%	May 15, 2025
INTRM	200602-06	6162660Y	243.3 PPM PROPANE/AIR	+/- 0.5%	Mar 17, 2027
ANALYTICAL EQUIPMENT					
Analytical Principle					
Last Multipoint Calibration					
Nicolet iS50 FTIR AUP2110295 CH4			Oct 13, 2021		
Nicolet iS50 FTIR AUP2110295 C3H8			Oct 14, 2021		

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.0 Kg
Net Weight: 4.9 Kg
PO# 5221004861



Michael A. Huber
Approved for Release

Copy

DRY GAS METER MC572V

Serial No. : 0504003

Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m3)

Meter Console Information

Console Model : MC572V
 Console serial : 0504003
 DGM Model # : SK25EX
 DGM Serial # : 00009854

Calibration Condition

Cal. Date: 22-Apr-24
 Due Date: 23-Apr-25
 Cal. Report No.: WDS-SV6704001
 Ambient Temp (°C): 25
 Pressure (mm Hg): 758
 Relative Humidity (%): 60

Factors/Conversion

Std. Temp. (°C): 298
 Std. Pressure (mm Hg): 760
 K: (K/mm Hg): 0.3857

Reference Equipment

WTM Model: W-NKoDa-5B WTM Cal. Due Date: Dec. 2023
 WTM Serial: 600245 Gamma: 1.0000

UUT Meter (DGM)					Reference Meter (WTM)				
Run Time (minutes)	DGM Orifice (mm H ₂ O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	P _{meas}	V _{me}	V _{ref}	t _{me}	t _{ref}	V _{me}	V _{ref}	t _{me}	t _{ref}
15.00	13.0	144.5926	144.7699	26	27	60.06607	60.24392	29	28
10.00	25.0	144.8168	144.9795	27	27	60.29098	60.45472	27	27
8.00	50.0	145.0164	145.2002	28	28	60.49135	60.67317	29	27
7.00	80.0	145.2238	145.4291	28	28	60.69691	60.90186	29	28
5.00	120.0	145.4909	145.6692	28	29	60.96349	61.14145	27	26

Standardized Data				Calibration Results			
Test Meter		Reference Meter		Correction Factor		Flow Rate	
Std. Volume	Std. Flow Rate	Std. Volume	Std. Flow Rate	"Gamma"	Variation	Std & Corr	0.0212 SCMM
V _{me std} (m ³)	Q _{me std} m ³ /min	V _{ref std} (m ³)	Q _{ref std} m ³ /min	(Y)	(ΔY)	Q _{me std corr}	ΔH _a
0.173	0.012	0.173	0.012	0.997	0.003	0.012	43.309
0.159	0.016	0.160	0.016	1.004	0.011	0.016	43.381
0.179	0.022	0.176	0.022	0.984	-0.009	0.022	45.447
0.201	0.029	0.199	0.028	0.989	-0.005	0.028	44.202
0.175	0.035	0.174	0.035	0.994	0.000	0.035	44.497
				0.993	= Y Avg	44.167	= ΔH _a Avg

Pass/Fail Result: **Pass**

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

Note: For ΔH_a, orifice pressure differential that equates to 0.75cfm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2 inches (5.1mm) H₂O

Approved By: _____

(Palpasu Chaisana)
Service Manager

Date: 22-Apr-24

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Certificate of Calibration - Supplemental

METHOD 5 PRE-TEST CONSOLE CALIBRATION

Nomenclature

P₃ - Barometric Pressure
 DGM - Dry Gas Meter
 K₁ - Constant based on standard temp and press
 O - Run time, in minutes
 P_m - ΔH (Meter Pressure, gauge)
 V_m - Volume collected by test meter, corrected for STP
 Q_{me std} - Calculated flow rate of test meter
 K' - Critical orifice coefficient
 P_{ref} - Measured pressure of reference meter
 t_{ref} - Temperature measured in reference meter
 t_{me} - Temperature measured in test meter
 Y - Ratio of volume collected from test meter and orifice
 sc - Scaling Factor
 Counts_{std} - Number of pulse counts, standardized
 Counts_{total} - Number of raw pulse counts of a calibration run

Equations

$$V_{me std} = Y * K_1 \frac{V_m * P_{ref} - \frac{P_m}{K'}}{T_{ref}}$$

$$V_{me std} = Counts_{std} * Y_{avg}$$

$$Counts_{std} = K_1 \frac{Counts_{total} * (P_{ref} + \frac{P_m}{K'})}{T_{ref}}$$

$$Q_{me std} = \frac{V_{me std}}{t}$$

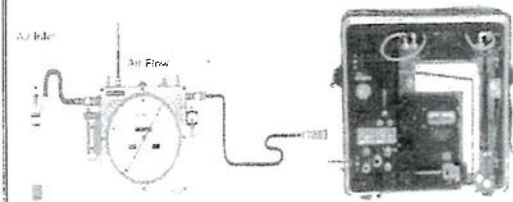
$$Y_{avg} = \frac{V_{me std}}{Counts_{std}}$$

$$K_1 = \frac{T_{ref}}{P_{ref}}$$

$$Y = \frac{V_{me std}}{V_{ref std}}$$

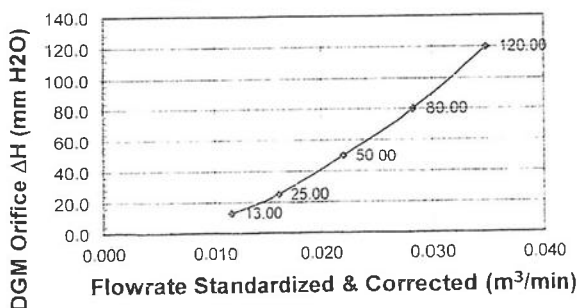
$$V_{ref std} = \frac{P_{ref} * 0.00110236 * P_{ref} * \frac{t_{ref}}{K'}}{T_{ref}} \left(\frac{T_{ref}}{P_{ref}} \right)$$

Calibration Train



Calibration Graphs

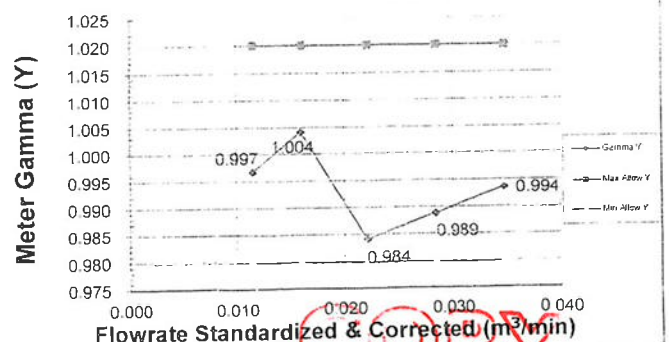
Meter Pressure vs Flowrate



Console Serial: 0504003

Console Model: MC572V

Meter Gamma vs Flowrate



Console Serial: 0504003

Console Model: MC572V



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TEMPERATURE DISPLAY CALIBRATION

Meter Console Information

Console Model	MC572V
Console serial	0504003
Temp indicator Model	765-KF
Temp indicator Serial	JC05630

Calibration Conditions

Cal Date	22-Apr-24
Due Date	23-Apr-25
Cal Report No	WDS-SV6704001
Ambient Temp (°C)	25
Pressure (mm Hg)	758
Humidity (%)	60

Reference Equipment

Temp Meter Model	Fluke 714B
Serial No	60590035
Cal Date	07-Apr-24
Temp Meter Model	Fluke 179
Serial No	5820112
Cal Date	06-Feb-24

Temperature Sensor Calibration

Reference Point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
1	-18.0	-17.0	1.0
2	38.0	37.0	1.0
3	93.0	93.0	0.0
4	149.0	150.0	-1.0
5	260.0	259.0	1.0
6	371.0	372.0	-1.0
7	482.0	482.0	0.0
8	593.0	593.0	0.0
9	816.0	815.0	1.0
10	1038.0	1038.0	0.0
Maximum			1.0

Note

¹ For valid test results, the maximum difference between temperature readings should $\leq 1.0^{\circ}\text{C}$ (EPA Method 5, Section 6.1.1.8).
Perform all TC Channel calibrations. Except meter (DGM) channel

PASS

DGM Out Temperature Sensor Calibration

Temperature point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
Ice	0.0	1.0	-1.0
Ambient	26.5	26.0	0.5
Heat	109.3	110.0	-0.7
Difference Range			
Temp. Difference			$\pm 2^{\circ}\text{F}$ or $\pm 1^{\circ}\text{C}$

PASS

Note

The temperatures of the thermocouple and reference thermometers shall agree to within $\pm 2^{\circ}\text{F}$ (EPA Method 5, section 10.5)

Approved By :

(Paipasu Chaisana)

Service Manager

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DRY GAS METER XC-572-OV

Serial No. : A2204323



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Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m3)

Meter Console Information

Console Model : XC-572-OV
 Console serial : A2204323
 DGM Model #: SK25EX
 DGM Serial #: 00008294

Calibration Condition

Cal. Date: 22-May-24
 Due Date: 22-May-25
 Cal. Report No.: WDS-SV6704018
 Ambient Temp (°C): 25
 Pressure (mm Hg): 758
 Relative Humidity (%): 60

Factors/Conversion

Std. Temp (°K): 298
 Std. Pressure (mm Hg): 760
 K₁ (K/mm Hg): 0.3857

Reference Equipment

WTM Model: W-NKoDa-5B WTM Cal. Due Date: Dec, 2024
 WTM Serial: 600245 Gamma: 1.0000

Run Time (minutes)	DGM Orifice (mm H ₂ O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	P _{m(g)}	V _m	V _{ref}	T _m	T _{ref}	V _m	V _{ref}	T _m	T _{ref}
15.00	13.0	194.6567	194.8274	26	27	61.39400	61.56423	28	27
10.00	25.0	195.0941	195.2514	28	28	61.82541	61.98088	29	28
8.00	50.0	195.2786	195.4572	28	28	62.00769	62.18342	28	27
7.00	80.0	195.4877	195.6846	28	29	62.21353	62.40748	28	27
5.00	120.0	195.7085	195.8796	29	29	62.43108	62.60020	26	27

Standardized Data				Calibration Results				
Test Meter		Reference Meter		Correction Factor		Flow Rate	ΔH@ (mm H ₂ O)	
Std. Volume	Std. Flow Rate	Std. Volume	Std. Flow Rate	"Gamma"	Variation	Std & Corr	0.0212 SCMM	Variation
V _{m(std)} (m ³)	Q _{m(std)} m ³ /min	V _{ref(std)} (m ³)	Q _{ref(std)} m ³ /min	(Y)	(ΔY)	Q _{m(std)corr}	ΔH _{sp}	ΔΔH _{sp}
0.167	0.011	0.166	0.011	0.994	0.008	0.011	47.022	-1.348
0.153	0.015	0.151	0.015	0.986	0.000	0.015	48.311	-0.059
0.174	0.022	0.171	0.021	0.981	-0.005	0.021	48.458	0.089
0.192	0.027	0.189	0.027	0.981	-0.004	0.027	48.869	0.499
0.167	0.033	0.165	0.033	0.986	0.000	0.033	49.189	0.819
				0.985	= Y Avg		48.370	= ΔH@ Avg

Pass/Fail Result: Pass

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

Note: For ΔH_{sp}, orifice pressure differential that equates to 0.75cfm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2inches (5.1mm) H₂O

Approved By: _____

(Palpasu Chaisana)
 Service Manager

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 WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

Date: 22-May-24

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Certificate of Calibration - Supplemental

METHOD 5 PRE-TEST CONSOLE CALIBRATION

Nomenclature

P_b - Barometric Pressure
 DGM - Dry Gas Meter
 K₁ - Constant based on standard temp and press
 t - Run time, in minutes
 P_m - ΔH (Meter Pressure, gauge)
 V_m - Volume collected by test meter, corrected for STP
 Q_{m(std)} - Calculated flow rate of test meter
 K' - Critical orifice coefficient
 P_w - Measured pressure of reference meter
 T_w - Temperature measured in reference meter
 T_m - Temperature measured in test meter
 Y - Ratio of volume collected from test meter and orifice
 sc - Scaling Factor
 Counts_{std} - Number of pulse counts, standardized
 Counts_{total} - Number of raw pulse counts of a calibration run

Equations

$$V_{m(std)} = Y * K_1 \frac{V_w * (P_{bar} + \frac{P_{m,sc}}{1.36})}{T_w}$$

$$V_{m(std)} = Counts_{std} * Y_{sc(avg)}$$

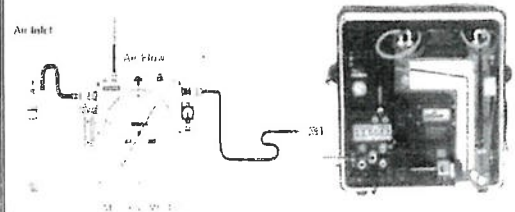
$$Counts_{std} = K_1 \frac{Counts_{total} * (P_{bar} + \frac{P_{m,sc}}{1.36})}{T_w}$$

$$Q_{m(std)} = \frac{V_{m(std)}}{t} \quad Y = \frac{V_{m(std)}}{Counts_{std}}$$

$$K_1 = \frac{T_{ref}}{P_{std}} \quad Y = \frac{V_{m(std)}}{Counts_{std}}$$

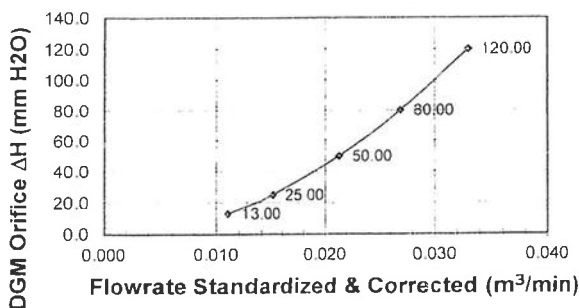
$$Metric \Delta H_s = \frac{P_{m,sc} + 0.00116(P_{bar} + \frac{P_{m,sc}}{1.36})}{T_w} \left(\frac{T_w}{T_{ref}} - 1 \right)$$

Calibration Train



Calibration Graphs

Meter Pressure vs Flowrate

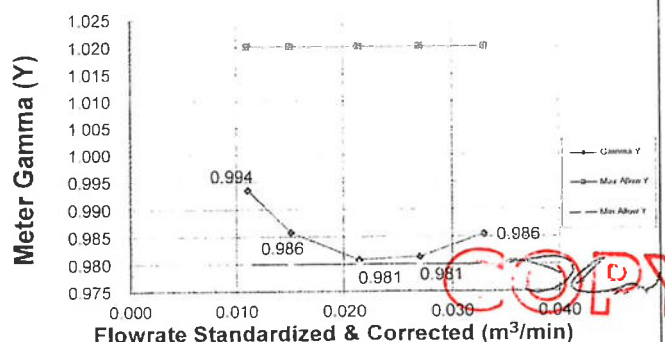


Console Serial: A2204323

Console Model: XC-572-

A-36

Meter Gamma vs Flowrate



Console Serial: A2204323

Console Model: XC-572-OV

TEMPERATURE DISPLAY CALIBRATION

Meter Console Information

Console Model	XC-572-OV
Console serial	A2204323
Temp Indicator Model	765-KF
Temp Indicator Serial	JCB6630

Calibration Conditions

Cal Date	22-May-24
Due Date	22-May-25
Cal Report No	WDS-SV6704018
Ambient Temp (°C)	25
Pressure (mm Hg)	758
Humidity (%)	60

Reference Equipment

Temp Meter Model*	Fuke 714B
Serial No	60500035
Cal Date	07-Apr-24
Temp Meter Model	Fuke 179
Serial No	58620112
Cal Date	06-Feb-24

Temperature Sensor Calibration

Reference Point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
1	-18.0	-17.0	1.0
2	38.0	37.0	1.0
3	93.0	93.0	0.0
4	149.0	150.0	-1.0
5	260.0	259.0	1.0
6	371.0	372.0	-1.0
7	482.0	482.0	0.0
8	593.0	593.0	0.0
9	816.0	815.0	1.0
10	1038.0	1038.0	0.0
Maximum ¹			1.0

Note

¹ For valid test results, the maximum difference between temperature readings should $\leq 1.0^{\circ}\text{C}$ (EPA Method 5, Section 6.1.1.8)
Perform all TC Channel calibrations. Except meter (DGM) channel

PASS

DGM Out Temperature Sensor Calibration

Temperature point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
Ice	0.0	1.0	-1.0
Ambient	27.5	27.0	0.5
Heat	108.6	109.0	-0.4
Difference Rang			
Temp. Difference $\pm 2^{\circ}\text{F}$ or $\pm 1^{\circ}\text{C}$			

PASS

Note

The temperatures of the thermocouple and reference thermometers shall agree to within $\pm 2^{\circ}\text{F}$ (EPA Method 5, section 10.5)

Approved By :

Palpasu Chaisana
(Palpasu Chaisana)
Service Manager

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DRY GAS METER XC-572-V

Serial No. : 1110070



WISDOM SCIENCE
SALE AND SERVICE GROUP COMPANY LIMITED

Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m3)

Meter Console Information

Console Model : XC-572-V
Console serial : 1110070
DGM Model #: SK25EX
DGM Serial #: 00006432

Calibration Condition

Cal. Date: 28-Jun-24
Due Date: 28-Jun-25
Cal. Report No.: WDS-SV6706007
Ambient Temp (°C): 25
Pressure (mm Hg): 758
Relative Humidity (%): 60

Factors/Conversion

Std. Temp. (°K): 298
Std. Pressure (mm Hg): 760
K₁ (K/mm Hg): 0.3857

Reference Equipment

WTM Model: W-NKoDa-5B WTM Cal. Due Date: Dec. 2024
WTM Serial: 600245 Gamma: 1.0000

UUT Meter (DGM)					Reference Meter (WTM)				
Run Time (minutes)	DGM Orifice (mm H ₂ O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial V _{mi}	Final V _{mf}	Initial t _{mi}	Final t _{mf}	Initial V _{wi}	Final V _{wf}	Initial t _{wi}	Final t _{wf}
15.00	13.0	239.7603	239.9212	27	27	63.63889	63.79843	27	27
10.00	25.0	239.9406	240.0979	27	27	63.81777	63.97353	27	27
8.00	50.0	240.1147	240.2952	27	28	63.99028	64.16968	26	26
7.00	80.0	240.3308	240.5352	28	28	64.20536	64.40956	26	26
5.00	120.0	240.5641	240.7422	29	29	64.43852	64.61730	26	26

Standardized Data				Calibration Results				
Test Meter		Reference Meter		Correction Factor		Flow Rate	ΔH@ (mm H ₂ O)	
Std. Volume V _{m(std)} (m ³)	Std. Flow Rate Q _{m(std)} m ³ /min	Std. Volume V _{w(std)} (m ³)	Std. Flow Rate Q _{w(std)} m ³ /min	"Gamma" (Y)	Variation (ΔY)	Std & Corr Q _{m(std/corr)}	0.0212 SCMM ΔH _B	Variation ΔΔH _B
0.157	0.010	0.155	0.010	0.991	-0.003	0.010	53.303	6.250
0.154	0.015	0.152	0.015	0.989	-0.005	0.015	47.860	0.807
0.176	0.022	0.175	0.022	0.993	-0.001	0.022	46.233	-0.820
0.200	0.029	0.199	0.028	0.997	0.003	0.028	43.895	-3.158
0.174	0.035	0.175	0.035	1.001	0.007	0.035	43.973	-3.080
				0.994	= Y Avg.		47.053	= ΔH@ Avg.

Pass/Fail Result: **Pass**

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.

Note: For ΔH_B, orifice pressure differential that equates to 0.75cfm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2inches (5.1mm) H₂O.

Approved By:
(Palpasu Chaisana)
Service Manager

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WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

Date: 28-Jun-24

COPY

Certificate of Calibration - Supplemental

METHOD 5 PRE-TEST CONSOLE CALIBRATION

Nomenclature

P_b - Barometric Pressure
DGM - Dry Gas Meter
K₁ - Constant based on standard temp and press
θ - Run time, in minutes
P_m - ΔH (Meter Pressure, gauge)
V_m - Volume collected by test meter, corrected for STP
Q_{m(std)} - Calculated flow rate of test meter
K' - Critical orifice coefficient
P_w - Measured pressure of reference meter
t_w - Temperature measured in reference meter
t_m - Temperature measured in test meter
Y - Ratio of volume collected from test meter and orifice
sc - Scaling Factor
Counts_{std} - Number of pulse counts, standardized
Counts_{raw} - Number of raw pulse counts of a calibration run

Equations

$$V_{w(std)} = Y * K_1 \frac{V_w * (P_{bar} + \frac{P_{m(std)}}{13.6})}{T_w}$$

$$V_{m(std)} = Counts_{std} * Y_{sc(avg)}$$

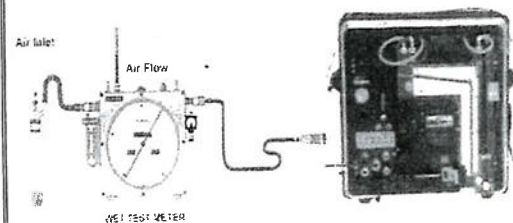
$$Counts_{std} = K_1 \frac{Counts_{total} * (P_{bar} + \frac{P_{m(std)}}{13.6})}{T_m}$$

$$Q_{w(std)} = \frac{V_{w(std)}}{\theta} \quad Y_{sc} = \frac{V_{w(std)}}{Counts_{std}}$$

$$K_1 = \frac{T_{std}}{P_{std}} \quad Y = \frac{V_{m(std)}}{V_{w(std)}}$$

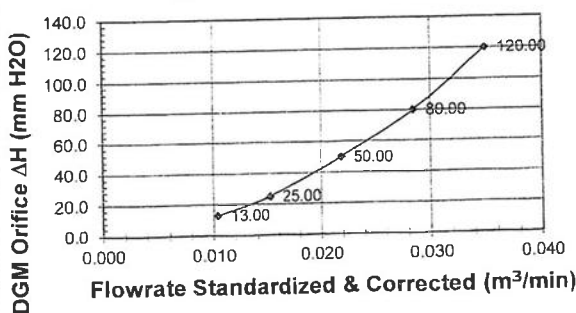
$$Metric \Delta H = \frac{P_{bar} * 0.0011636 * (P_{m} + \frac{P_{m(std)}}{13.6})}{F_{sc}} * \left(\frac{T_w * \theta}{V_w * P_{m(std)}} \right)^2$$

Calibration Train

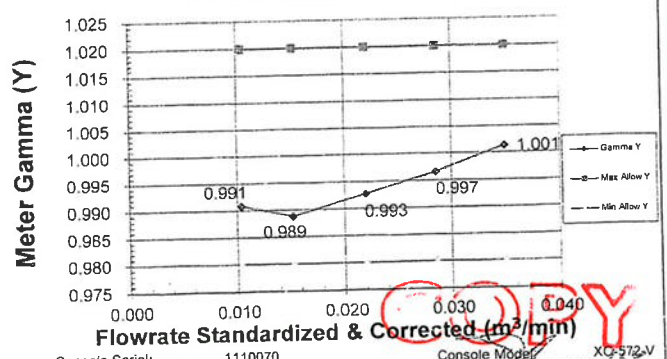


Calibration Graphs

Meter Pressure vs Flowrate



Meter Gamma vs Flowrate



Console Serial: 1110070

Console Model: XC-572-V

Console Serial: 1110070

Console Model: XC-572-V

TEMPERATURE DISPLAY CALIBRATION

Meter Console Information

Console Model : XC-572-V
Console serial : 1110070
Temp Indicator Model : ID-65
Temp Indicator Serial : -

Calibration Conditions

Cal. Date : 28-Jun-24
Due Date : 28-Jun-25
Cal. Report No. : WDS-SV6706007
Ambient Temp. (°C) : 25
Pressure (mm Hg) : 758
Humidity (%) : 60

Reference Equipment

Temp. Meter Model : Fluke 714B
Serial No. : 60590035
Cal. Date : 07-Apr-24
Temp. Meter Model : Fluke 179
Serial No. : 58520112
Cal. Date : 08-Feb-24

Temperature Sensor Calibration

Reference Point	Ref. Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
1	-18.0	-17.0	1.0
2	36.0	39.0	-1.0
3	93.0	94.0	-1.0
4	149.0	150.0	-1.0
5	260.0	261.0	-1.0
6	371.0	372.0	-1.0
7	482.0	483.0	-1.0
8	593.0	593.0	0.0
9	616.0	815.0	1.0
10	1033.0	1038.0	0.0 ~ 1.0
Maximum *			1.0

Note

¹ For valid test results, the maximum difference between temperature readings should $\leq 1.0^{\circ}\text{C}$ (EPA Method 5, Section 6.1.1.8).
Perform all TC Channel calibrations. Except meter (DGM) channel

PASS

DGM Out Temperature Sensor Calibration

Temperature point	Ref. Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
Ice	1.0	2.0	-1.0
Ambient	24.2	25.0	-0.8
Heat	110.5	111.0	-0.5
Difference Range			
Temp. Difference			$\pm 2^{\circ}\text{F}$ or $\pm 1.1^{\circ}\text{C}$

Note

The temperatures of the thermocouple and reference thermometers shall agree to within $\pm 2^{\circ}\text{F}$. (EPA Method 5, section 10.5)

PASS

Approved By :

Patpasu Chaisana

(Patpasu Chaisana)

Service Manager

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11130 Thailand

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DRY GAS METER MC-572-V

Serial No. : 1007055

Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m3)

Meter Console Information

Console Model : MC-572-V
 Console serial : 1007055
 DGM Model #: SK25EX
 DGM Serial #: 0009799

Calibration Condition

Cal. Date : 04-Aug-24
 Due Date : 04-Aug-25
 Cal. Report No. : WDS-SV6707001
 Ambient Temp (°C) : 25
 Pressure (mm Hg) : 758
 Relative Humidity (%) : 60

Factors/Conversion

Std. Temp. (°K) : 298
 Std. Pressure (mm Hg) : 760
 K₁ (K/mm Hg) : 0.3857

Reference Equipment

WTM Model : W-NKoDa-5B WTM Cal. Due Date : Dec. 2024
 WTM Serial : 600245 Gamma : 1.0000

UUT Meter (DGM)					Reference Meter (WTM)				
Run Time (minutes)	DGM Orifice (mm H ₂ O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
15.00	13.0	107.7550	107.9221	29	30	68.41024	68.57350	28	27
10.00	25.0	107.9308	108.0876	30	30	68.58202	68.73488	27	27
8.00	50.0	108.1027	108.2822	30	30	68.74958	68.92516	27	27
7.00	80.0	108.3029	108.5061	30	30	68.94550	69.14488	27	27
5.00	120.0	108.5139	108.6908	30	30	69.15251	69.32550	27	27

Standardized Data				Calibration Results				
Test Meter		Reference Meter		Correction Factor		Flow Rate	ΔH@ (mm H ₂ O)	
Std Volume	Std Flow Rate	Std Volume	Std Flow Rate	"Gamma"	Variation	Std & Corr	ΔH _{sc}	Variation
V _{m(Std)} (m ³)	Q _{m(Std)} m ³ /min	V _{r(Std)} (m ³)	Q _{r(Std)} m ³ /min	(Y)	(ΔY)	Q _{m(Std/Corr)}	ΔH _{sc}	ΔΔH _{sc}
0.162	0.011	0.159	0.011	0.982	0.000	0.011	50.751	2.535
0.152	0.015	0.149	0.015	0.982	0.001	0.015	49.300	1.084
0.174	0.022	0.171	0.021	0.983	0.002	0.021	48.061	-0.155
0.197	0.028	0.194	0.028	0.983	0.002	0.028	45.922	-2.293
0.173	0.035	0.169	0.034	0.976	-0.005	0.034	47.046	-1.170
				0.981	= Y Avg			
							48.216	= ΔH@ Avg

Pass/Fail Result: Pass

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

Note: For ΔH_{sc}, orifice pressure differential that equates to 0.75cfm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2inches (5.1mm) H₂O

Approved By:

(Patpasu Chaisana)
 Service Manager

WISDOM
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 WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

Date: 04-Aug-24

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Certificate of Calibration - Supplemental

METHOD 5 PRE-TEST CONSOLE CALIBRATION

Nomenclature

Equations

Calibration Train

P_a - Barometric Pressure
 DGM - Dry Gas Meter
 K₁ - Constant based on standard temp and press
 t - Run time, in minutes
 P_m - ΔH (Meter Pressure, gauge)
 V_m - Volume collected by test meter, corrected for STP
 Q_{m(Std)} - Calculated flow rate of test meter
 K' - Critical orifice coefficient
 P_r - Measured pressure of reference meter
 t_r - Temperature measured in reference meter
 t_m - Temperature measured in test meter
 Y - Ratio of volume collected from test meter and orifice
 sc - Scaling Factor
 Counts_{std} - Number of pulse counts, standardized
 Counts_{raw} - Number of raw pulse counts of a calibration run

$$V_{m(Std)} = Y * K_1 \frac{V_r * (P_{bar} + \frac{P_r}{1.315})}{T_r}$$

$$V_{m(Std)} = Counts_{std} * Y_{sc(avg)}$$

$$Counts_{std} = K_1 \frac{Counts_{raw} * (P_{bar} + \frac{P_r}{1.315})}{T_m}$$

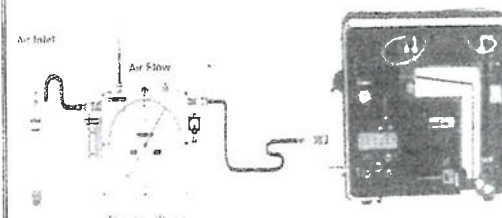
$$Q_{m(Std)} = \frac{V_{m(Std)}}{t}$$

$$Y_{sc} = \frac{V_{m(Std)}}{Counts_{raw} * t}$$

$$K_1 = \frac{T_{Std}}{P_{Std}}$$

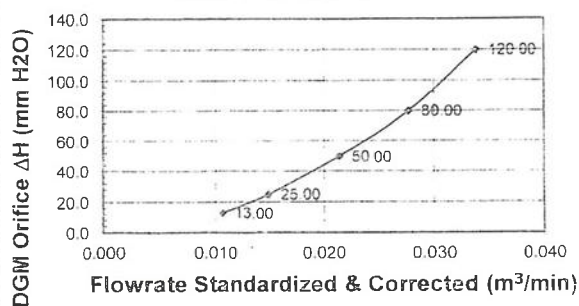
$$Y_{sc} = \frac{V_{m(Std)}}{Counts_{raw} * t}$$

$$Y_{sc} = \frac{V_{m(Std)}}{Counts_{raw} * t}$$

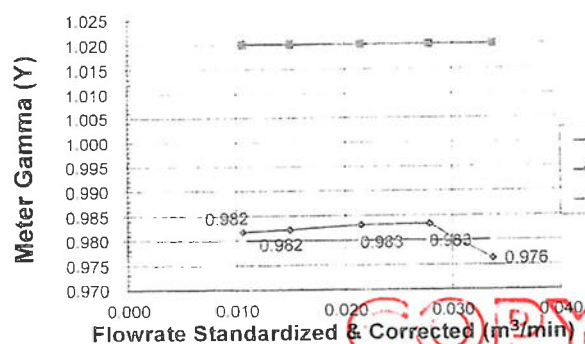


Calibration Graphs

Meter Pressure vs Flowrate



Meter Gamma vs Flowrate



Console Serial: 1007055

Console Model:

MC-572-V

Console Serial: 1007055

Console Model:

MC-572-V



WISDOM SCIENCE

TEMPERATURE DISPLAY CALIBRATION

Meter Console Information

Console Model	MC-372-V
Console serial	1007055
Temp Indicator Model	765-KF
Temp Indicator Serial	JC17852

Calibration Conditions

Cal Date	04-Aug-24
Due Date	04-Aug-25
Cal Report No	WDS-SV8707001
Ambient Temp (°C)	25
Pressure (mm Hg)	758
Humidity (%)	60

Reference Equipment

Temp Meter Model	Fuke 714B
Serial No	80590035
Cal. Date	07-Apr-24
Temp Meter Model	Fuke 179
Serial No	58520112
Cal Date	06-Feb-24

Temperature Sensor Calibration

Reference Point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
1	-18.0	-18.0	0.0
2	38.0	38.0	0.0
3	93.0	94.0	-1.0
4	149.0	149.0	0.0
5	280.0	261.0	-1.0
6	371.0	372.0	-1.0
7	482.0	482.0	0.0
8	593.0	593.0	0.0
9	816.0	816.0	0.0
10	1038.0	1038.0	0.0
Maximum			1.0

Note

¹ For valid test results, the maximum difference between temperature readings should $\leq 1.0^{\circ}\text{C}$ (EPA Method 5, Section 6.1.1.8).
Perform all TC Channel calibrations. Except meter (DGM) channel

PASS

DGM Out Temperature Sensor Calibration

Temperature point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
Ice	0.0	0.0	0.0
Ambient	25.9	27.0	-0.1
Heat	114.5	115.0	-0.5
Difference Range			
Temp. Difference			$\pm 2^{\circ}\text{F}$ or $\pm 1^{\circ}\text{C}$

PASS

Note

The temperatures of the thermocouple and reference thermometers shall agree to within $\pm 2^{\circ}\text{F}$ (EPA Method 5, section 10.5)

Approved By :

Patpasu Chaisana
(Patpasu Chaisana)
Service Manager



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Flue gas Analyzer

Testo 350XL

Serial No. 01794619/002



Calibration Certificate

ENTECH
Difference For Greater Value

Certificate No: G 670415
Date of issue : 25-Jun-24

Instrument description : Flue Gas Analyzer
Instrument model : Testo 350XL
Control unit serial no. : 01794619/002
Instrument serial no. : 01807527/002
ID no. or control no. : -
Manufacturer : Testo SE & Co. KGaA
Probe description : -
Probe model : -
Probe serial no. : -
Customer name : Eastern Thai Consulting 1992 Company Limited
Customer address : 683 Moo 11, Sukhapibarn 8 Road, Nongkham, Si Racha, Chon Buri 20280

Total pages of certificate : 2 Pages
Receiving no. : L-242269
Receiving date. : 19-Jun-24
Parameter of calibration : Gas Calibration(Oxygen 2.50,10.04,21.02 %vol, Carbon Monoxide 80.18,302,1001 ppm, Nitrogen Dioxide 30.34,81.32, 201.9 ppm, Nitric Oxide 30.01, 151.5, 322.5 ppm, Sulphur Dioxide 50.36, 100.8, 600.8 ppm)

Condition of UUC. :
Ambient condition : All of the Measurement were carried out the stabilized laboratory
Temperature : 23 ± 5 °C
Humidity : 55 ± 15 %RH

Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210

Calibration procedure no. : 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 : 24-Jun-24

Kamchanke

Mr. Kwanchai Khamdour
Calibration Technician

ก้องเกียรติ นามศิริ

Mrs. Nongnuch Hamlaila
Technical Manager

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O2) 2.50 % Vol	2412/23	Linde	27-Aug-27
Oxygen (O2) 10.04 % Vol	CG-0153-21	Nimit	18-Nov-26
Oxygen (O2) 21.02 % Vol	CG-0041-22	Nimit	10-Feb-27
Carbon monoxide (CO) 80.18 ppm	CG-0002-24	Nimit	11-Jan-29
Carbon monoxide (CO) 302 ppm	1915/23	Linde	16-Jun-25
Carbon monoxide (CO) 1001 ppm	CG-0085-24	Nimit	22-May-29
Nitrogen Dioxide (NO2) 30.34 ppm	2703/22	Linde	22-Aug-24
Nitrogen Dioxide (NO2) 81.32 ppm	3546/23	Linde	14-Jan-26
Nitrogen Dioxide (NO2) 201.9 ppm	1975/23	Linde	17-Jul-25
Nitric Oxide (NO) 30.01 ppm	CG-0014-23	Nimit	19-Feb-25
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 (SO2) 50.36 ppm	2004/23	Linde	17-Jul-25
Sulphur Dioxide (SO2) 100.8 ppm	3507/22	Linde	09-Nov-24
Sulphur Dioxide (SO2) 600.8 ppm	2003/23	Linde	17-Jul-25

Measured room conditions

Temperature : 24.1 °C Humidity : 62.8 %RH Pressure : 1009.9 mbar
Gas Temperature : 24 °C Flow rate : 1,000 ml/min Gas pressure : 1014.7 mbar

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O2 (%Vol)	2.50	2.48	-0.02	0.15
O2 (%Vol)	10.04	9.93	-0.11	0.20
O2 (%Vol)	21.02	21.11	0.09	0.30
CO (ppm)	80.18	81	0.82	3.0
CO (ppm)	302	302	0	6.0
CO (ppm)	1001	1002	1	12
NO2 (ppm)	30.34	31.5	1.16	8.0
NO2 (ppm)	81.32	82.3	0.98	8.0
NO2 (ppm)	201.9	201.2	-0.7	12
NO (ppm)	30.01	32	1.99	8.0
NO (ppm)	151.5	155	3.5	8.0
NO (ppm)	322.5	327	4.5	12
SO2 (ppm)	50.36	49	-1.36	6.0
SO2 (ppm)	100.8	100	-0.8	6.0
SO2 (ppm)	600.8	602	1.2	13

Remark : 1 cmol/mol = 1 %vol. 1 μmol/mol = 1 ppm.

End of Report

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Hot Air Oven

Model : UFE 500

Serial No. : G511.0182



CERTIFICATE OF CALIBRATION

Page 1 of 3
Certificate No. : 23-148804
Sample Code : 23-56200-006Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Si Racha, Chonburi 20230Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Hot Lab)Equipment : Temperature controlled enclosures (Hot air oven)
Manufacturer : Memmert
Serial No. : G511.0182
Date of Receipt : 22 December 2023
Model : UFE 500
ID No. : LABE 17/4
Date of Calibration : 22 December 2023

Condition of Calibration

1. Environment
- | | | | | |
|---------------------------|-----------|-----------|-----------|-----------|
| 1.1 Ambient temperature | : Maximum | 30.9 °C | : Minimum | 29.6 °C |
| 1.2 Relative humidity | : Maximum | 54.5 % | : Minimum | 46.8 % |
| 1.3 Line voltage supplied | : Maximum | 227.6 VAC | : Minimum | 224.2 VAC |

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-Pt100)	LB-DA-08 (RTD-248 to RTD-256)	23-084070	06 August 2024

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by

Mr. Pisek Into
Scientist

Approved by

(Mr. Sornchai Neampunt)
Signed for Director

Issue date

25 December 2023

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

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

This Certificate is issued in accordance with the conditions of accreditation granted by the Thai Laboratory Accreditation scheme which has designed 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladprao 122, Ladprao Road,

Phlabphla, Wang Thonglang, Bangkok 10310

FM CL 014

TEL 02-516-2422

FAX 02-516-6949

Rev 01

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date 15/10/21



REPORT OF CALIBRATION

Page 2 of 3
Certificate No. : 23-148804
Sample Code : 23-56200-006

Results of Calibration

Resolution : 0.5 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k	
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8			# g ^{ref}
104	103.5	103.5	104.11	103.94	103.85	103.84	103.97	103.93	103.64	103.51	104.23	0.47	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
104	0.04	0.78	0.81

Notes

UUC* = Unit Under Calibration

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Phlabphla, Wang Thonglang, Bangkok 10310

FM CL 018

TEL 02-516-2422

FAX 02-516-6949

Rev 09

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date 15/10/21



REPORT OF CALIBRATION

NSC-TIS-TIS17025
CALIBRATION 0152

Page 3 of 3

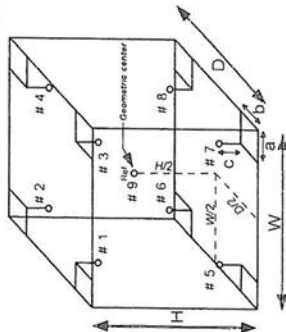
Certificate No. : 23-148804

Sample Code : 23-56200-006

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 56 cm ; D = 40 cm ; H = 48 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

Figure: Example of sensor
installation Positions

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

- End of Report -

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UV/VIS SPECTROPHOTOMETER

Model : UV-1800

Serial No. : A11635101643 CD



Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Rama4 Road
Silom Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-146/24
Equipment UV/Vis Spectrophotometer
Model UV-1800
Manufacturer Shimadzu
Serial No. A11635101643 CD
ID No. LABE 03/2
Date of receipt 22 April 2024
Date of calibration 22 April 2024
Date of issue 29 April 2024
Customer name Eastern Thai Consulting 1992 Co., Ltd.
Address 683 Moo 11, Sukkaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Temperature (22.9-24.1) °C (On site)
Humidity (41.7-46.9) %RH (On site)

Equipment condition Good Operation

Calibration Location Analysis Department

Calibration Procedure In-house method WI-UV-702-01 based on ASTM E275-01

Traceability
Wavelength Accuracy is traceable to certificate No. 116614 and 116613
Photometric Accuracy is traceable to certificate No. 116210 and 116224
Stray Light is traceable to certificate No. 116616
The above certificate are traceable to SI unit through Siarna Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr Poomjai Korsawavorakul

Approved by

Mr. Sonthi Temboonsakdi

Mr. Sonthi Temboonsakdi
Service Manager

The above results are valid exclusively for the calibrated item(s) as mention in this report / certificate
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Certificate of Calibration

Number of Page(s) 2 of 3

Certificate No. BSCC-UV-146/24

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
287.71	287.75	0.04	0.18
445.82	445.89	0.07	0.18
536.52	536.50	-0.02	0.18
741.02	741.01	-0.01	0.18
879.41	879.33	-0.08	0.18

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
	0.7415	0.7387	-0.0028	0.0075
257	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
313	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	0.0075
	0.6406	0.6395	-0.0011	0.0075

*CNR = Customer not request

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Silom Bangkok Bangkok Thailand 10500
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Certificate of Calibration

Certificate No. **BSCC-UV-146/24** Number of Page(s) **3 of 3**

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (\pm A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5715	0.5729	0.0014	0.0042
	0.7087	0.7087	0.0000	0.0042
	1.0987	1.1005	0.0018	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5561	0.5578	0.0017	0.0042
	0.6968	0.6969	0.0001	0.0042
	1.0757	1.0774	0.0017	0.0042
465.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
546.1	0.0000	0.0000	0.0000	0.0042
	0.5193	0.5213	0.0020	0.0042
	0.6937	0.6940	0.0003	0.0042
	1.0411	1.0428	0.0017	0.0042
590.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
635.0	0.0000	0.0000	0.0000	0.0042
	0.5605	0.5624	0.0019	0.0042
	0.7579	0.7583	0.0004	0.0042
	1.1131	1.1138	0.0007	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)	
	Wavelength (nm)	Absorbance (A)
201.33±0.11nm	200.80	2.0111

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is based on a standard uncertainty multiplied by a coverage factor (k=2) providing a level of confidence of approximately 95%.

End of Certificate

The above results are valid exclusively for the calibrated item(s) as mentioned in this report / certificate. Advertising the report / Certificate and publicity of the results are prohibited and also shall not be reproduced except in full, without written approval of the Bara Scientific Co., Ltd.

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ANALYTICAL BALANCE (DU)

Model : XS205DU

Serial No. : 1126323724



Certificate No. : 23-148799

Sample Code : 23-56200-001

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapi Barn 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by : Mr. Somwang Sangdee
Scientist
Approved by : (Mr. Somchai Neampunt)
Signed for Director

Issue date : 25 December 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 23-148799

Sample Code : 23-56200-001

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE
Manufacturer : METTLER TOLEDO
Model : XS205DU
Capacity : Max 81 g / 220 g
Resolution : 0.01 mg / 0.1 mg
Serial No. : 1126323724
ID No. : LABE 05/1

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 80	<input checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	40 80 40 80	
<input checked="" type="checkbox"/> Adjustment	Standard weight	40.000054 80.000048 40.000054 80.000048	
	Average reading of indicator	40.000026 80.000037 40.000017 80.000017	
	Standard deviation	0.000015 0.000016 0.000008 0.000009	
Unit : g	Range : 200	<input checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100 200	
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042 200.000041	
	Average reading of indicator	100.00003 200.00004 100.00001 200.00001	
	Standard deviation	0.00005 0.00005 0.00003 0.00005	

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Certificate No. : 23-148799

Sample Code : 23-56200-001

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Range : 80 Test Point Range : 200

Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	1.00748	0	1.0274
40	0.98753	100	0.9375
80	0.99751	200	0.9375

3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.0000000	0.00000	0.00000	0.000012	2.05
0.01	0.0100025	0.01000	0.00000	0.000012	2.05
0.1	0.1000019	0.10001	-0.00001	0.000013	2.03
1	1.0000125	1.00001	0.00000	0.000015	2.02
5	5.0000208	5.00004	-0.00002	0.000021	2.00
10	10.0000004	10.00008	-0.00008	0.000026	2.00
20	20.0000030	20.00011	-0.00008	0.000036	2.00
50	50.0000014	50.00014	-0.00013	0.000068	2.00
100	100.0000042	100.0001	-0.0001	0.00016	2.00
150	150.0000056	150.0001	0.0000	0.00022	2.00
200	200.0000041	200.0002	-0.0002	0.00027	2.00

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

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Certificate No. : 23-148799

Sample Code : 23-56200-001

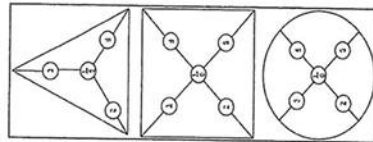
REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Weighing pan ☐ Circle ☐ Triangular ☒ Rectangular Test weight : 50 and 100 Unit : g



Range	Position	Reading of indicator	Reading of indicator
1	50.00015	100.00001	200
2	50.00022	100.00001	
3	50.00008	100.00001	
4	50.00002	100.00000	
5	50.00016	100.00002	
6	50.00014	100.00001	
Maximum difference	0.00013	0.0001	

Condition of Calibration

- Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibration item: Normal
- This certification is traceable to the International System of Unit maintained at : -
Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (Instrument number 1).
- Reference standard instrument :

Instrument
1) STANDARD WEIGHT 1 mg to 1 kg

Class E2
ID No. LB-WE-79

Certificate No. 23-105642

Due Date
10 September 2024

End of Report

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BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41

CALIBRATION CERTIFICATE



Certificate No. : L202405022-0013
 Date Issued : 08-May-24

Customer : Eastern Thai Consulting 1992 Co., Ltd.
 683 Moo 11, Sukhaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Analog Barometer

Manufacturer : Barigo
Model : -
Serial No. : -
ID No./Tag No. : BM001/41
Date Received : 03-May-24
Date Calibrated : 06-May-24

Calibrated by : Mr. Saruth Srithulikul

Calibration Method or Calibration Procedure Used

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

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

Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor $k = 2$, providing a level confidence approximately 95 percent.
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Approved by: 
 (Mr. Sarayuth Tochua)



Page 1 of 2

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Certificate No : L202405022-0013

Environment : Ambient Temperature : $(25 \pm 2)^{\circ}\text{C}$
 Relative Humidity : $(50 \pm 15)\%\text{RH}$

STD Reading	UUC Reading (mbar)	UUC Reading (mbar)	UUC Error	Uncertainty	MPE	Pass / Fail
mbar	Before Adjusted	After Adjusted	mbar	\pm mbar	\pm mbar	with Guard Band
990.00	990	-	0.00	0.59	10.3	Pass
1000.00	1000	-	0.00	0.59	10.3	Pass
1010.00	1010	-	0.00	0.59	10.3	Pass
1020.00	1020	-	0.00	0.59	10.3	Pass
1030.00	1030	-	0.00	0.59	10.3	Pass

STD = Standard Pass = $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$

UUC = Unit Under Calibration Fail = $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

MPE = Maximum Permissible Error

Calibrated condition : Pressure Medium Air : Density = $1.19 \text{ kg/m}^3 @ 20^{\circ}\text{C}$, 1 bar
 Mounting Position Vertical
 Reference Level at center of its dial
 Conversion Factor Multiply by $1.0 \text{ E}+02$ - Pa unit

Description of UUC :

Range	950 - 1080	mbar Absolute
Calibration Range	990 - 1030	mbar Absolute
Scale Interval	1	mbar

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

IRPC Certificate No. CL1-P230097 for Reference Pressure Monitor Serial No. 1598, Due 09-Nov-24

End of Certificate

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Page 2 of 2

DRY GAS METER MC572V

Serial No. : 0504003

Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m3)

Meter Console Information

Console Model : MC572V
 Console serial : 0504003
 DGM Model # : SK25EX
 DGM Serial # : 00009854

Calibration Condition

Cal. Date: 22-Apr-24
 Due Date: 23-Apr-25
 Cal Report No.: WDS-SV6704001
 Ambient Temp (°C): 25
 Pressure (mm Hg): 758
 Relative Humidity (%): 60

Factors/Conversion

Std. Temp. (°K): 298
 Std. Pressure (mm Hg): 760
 K: (K/mm Hg): 0.3857

Reference Equipment

WTM Model: W-NK0Da-5B WTM Cal Due Date: Dec. 2023
 WTM Serial: 600245 Gamma: 1.0000

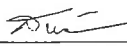
UUT Meter (DGM)					Reference Meter (WTM)				
Run Time (minutes)	DGM Orifice (mm H ₂ O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
a	P _{test}	V _{in}	V _{out}	t _{in}	t _{out}	V _{in}	V _{out}	t _{in}	t _{out}
15.00	13.0	144.5926	144.7699	26	27	60.06607	60.24392	29	28
10.00	25.0	144.8168	144.9795	27	27	60.29098	60.45472	27	27
8.00	50.0	145.0164	145.2002	28	28	60.49135	60.67317	29	27
7.00	80.0	145.2238	145.4291	28	28	60.69691	60.90186	29	26
5.00	120.0	145.4909	145.6692	28	29	60.96349	61.14145	27	26

Standardized Data				Calibration Results				
Test Meter		Reference Meter		Correction Factor		Flow Rate	VH@ (mm H ₂ O)	
Std. Volume	Std. Flow Rate	Std. Volume	Std. Flow Rate	"Gamma"	Variation	Std & Corr	0.0212 SCMM	Variation
V _{std} (m ³)	Q _{std} m ³ /min	V _{std} (m ³)	Q _{std} m ³ /min	(Y)	(ΔY)	Q _{std} (m ³ /min)	ΔH _g	ΔΔH _g
0.173	0.012	0.173	0.012	0.997	0.003	0.012	43.309	-0.858
0.159	0.016	0.160	0.016	1.004	0.011	0.016	43.381	-0.787
0.179	0.022	0.176	0.022	0.984	-0.009	0.022	45.447	1.280
0.201	0.029	0.199	0.028	0.989	-0.005	0.028	44.202	0.035
0.175	0.035	0.174	0.035	0.994	0.000	0.035	44.497	0.330
				0.993	= Y Avg		44.167	= ΔH@ Avg

Pass/Fail Result: **Pass**

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

Note: For ΔH_g, orifice pressure differential that equals to 0.75cfm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2 inches (5.1mm) H₂O

Approved By: 
 (Patpasu Chaisana)
 Service Manager

Date: 22-Apr-24

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Certificate of Calibration - Supplemental

METHOD 5 PRE-TEST CONSOLE CALIBRATION

Nomenclature

Equations

Calibration Train

P_s - Barometric Pressure
 DGM - Dry Gas Meter
 K₁ - Constant based on standard temp and press
 t - Run time, in minutes
 P_m - ΔH (Meter Pressure, gauge)
 V_m - Volume collected by test meter, corrected for STP
 Q_{std} - Calculated flow rate of test meter
 K' - Critical orifice coefficient
 P_w - Measured pressure of reference meter
 t_w - Temperature measured in reference meter
 t_m - Temperature measured in test meter
 Y - Ratio of volume collected from test meter and orifice
 sc - Scaling Factor
 Counts_{std} - Number of pulse counts, standardized
 C_{total} - Number of raw pulse counts of a calibration run

$$V_{std} = Y * K_1 \frac{V_m * P_w * T_m}{T_w * P_m}$$

$$V_{mstd} = Counts_{std} * Y_{sc(avg)}$$

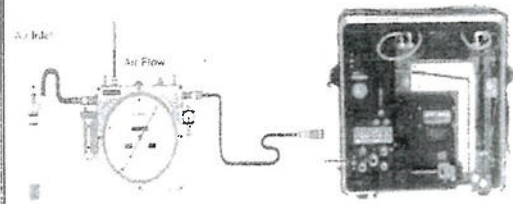
$$Counts_{std} = K_1 \frac{C_{total} * (P_{bar} + \frac{P_m}{K'})}{T_m}$$

$$Q_{std} = \frac{V_{std}}{t}$$

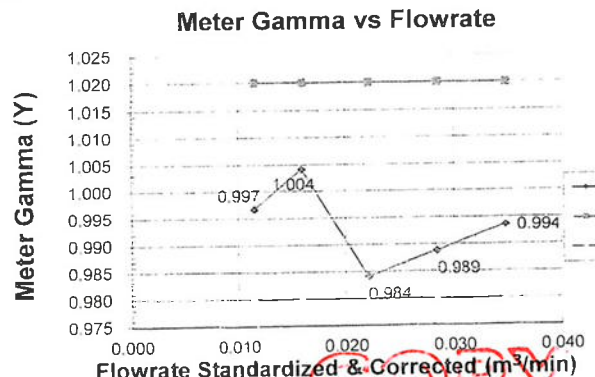
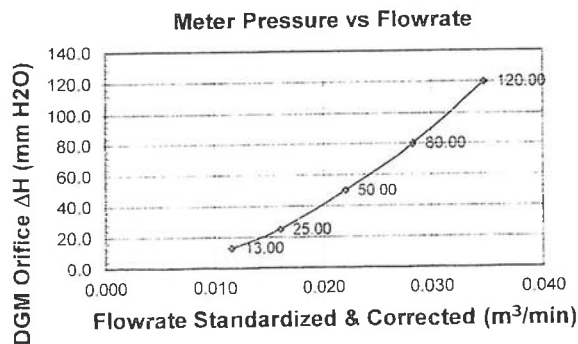
$$K' = \frac{T_{bi}}{P_{std}}$$

$$Y = \frac{V_{std}}{V_{mstd}}$$

$$V_{mstd} = \frac{P_{std} * 0.0011096 * P_{std} * \frac{T_m}{T_w}}{T_w}$$



Calibration Graphs



Console Serial: 0504003

Console Model: MC572V

Console Serial: 0504003

Console Model: MC572V



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TEMPERATURE DISPLAY CALIBRATION

Meter Console Information

Console Model MC572V
Console serial 0504003
Temp Indicator Model 765-KF
Temp Indicator Serial JC05630

Calibration Conditions

Cal Date 22-Apr-24
Due Date 23-Apr-25
Cal Report No WDS-SV8704001
Ambient Temp (°C) 25
Pressure (mm Hg) 758
Humidity (%) 60

Reference Equipment

Temp Meier Model Fluke 714B
Serial No 60590035
Cal Date 07-Apr-24
Temp Meier Model Fluke 179
Serial No 58520112
Cal Date 06-Feb-24

Temperature Sensor Calibration

Reference Point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
1	-18.0	-17.0	1.0
2	38.0	37.0	1.0
3	93.0	93.0	0.0
4	149.0	150.0	-1.0
5	260.0	259.0	1.0
6	371.0	372.0	-1.0
7	482.0	483.0	0.0
8	593.0	593.0	0.0
9	816.0	815.0	1.0
10	1038.0	1038.0	0.0
Maximum			1.0

Note

¹ For valid test results, the maximum difference between temperature readings should $\leq 1.0^{\circ}\text{C}$ (EPA Method 5, Section 6.1.1 b)
Perform all TC Channel calibrations. Except meter (DGM) channel

PASS

DGM Out Temperature Sensor Calibration

Temperature point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
Ice	0.0	1.0	-1.0
Ambient	26.5	26.0	0.5
Heat	109.3	110.0	-0.7
Difference Rang			
Temp. Difference	$\pm 2^{\circ}\text{F}$ or $\pm 1^{\circ}\text{C}$		PASS

Note

The temperatures of the thermocouple and reference thermometers shall agree to within $\pm 2^{\circ}\text{F}$ (EPA Method 5, section 10.5)

Approved By :

[Signature]

(Palpasu Chaisana)

Service Manager

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DRY GAS METER XC-572-OV

Serial No. : A2204323



WISDOM SCIENCE

Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m3)

Meter Console Information

Console Model : XC-572-OV
 Console serial : A2204323
 DGM Model #: SK25EX
 DGM Serial #: 00008294

Calibration Condition

Cal. Date: 22-May-24
 Due Date: 22-May-25
 Cal. Report No.: WDS-SV6704018
 Ambient Temp (°C): 25
 Pressure (mm Hg): 758
 Relative Humidity (%): 60

Factors/Conversion

Std Temp (°K): 298
 Std. Pressure (mm Hg): 760
 K₁ (K/mm Hg): 0.3857

Reference Equipment

WTM Model: W-NKoDa-5B WTM Cal. Due Date: Dec. 2024
 WTM Serial: 600245 Gamma: 1.0000

UUT Meter (DGM)						Reference Meter (WTM)			
Run Time (minutes)	DGM Orifice (mm H ₂ O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
15.00	13.0	194.6567	194.8274	26	27	61.39400	61.56423	28	27
10.00	25.0	195.0941	195.2514	28	28	61.82541	61.98088	29	28
8.00	50.0	195.2786	195.4572	28	28	62.00769	62.18342	28	27
7.00	80.0	195.4877	195.6846	28	29	62.21353	62.40748	28	27
5.00	120.0	195.7085	195.8796	29	29	62.43108	62.60020	26	27

Standardized Data				Calibration Results				
Test Meter		Reference Meter		Correction Factor		Flow Rate		
Std Volume	Std Flow Rate	Std Volume	Std Flow Rate	"Gamma"	Variation	Std & Corr	0.0212 SCMM	Variation
V _{std} (m ³)	Q _{std} m ³ /min	V _{std} (m ³)	Q _{std} m ³ /min	(Y)	(ΔY)	Q _{std} (m ³ /min)	ΔH _{sc}	ΔΔH _{sc}
0.167	0.011	0.166	0.011	0.994	0.008	0.011	47.022	-1.348
0.153	0.015	0.151	0.015	0.986	0.000	0.015	48.311	-0.059
0.174	0.022	0.171	0.021	0.981	-0.005	0.021	48.458	0.089
0.192	0.027	0.189	0.027	0.981	-0.004	0.027	48.869	0.499
0.167	0.033	0.165	0.033	0.986	0.000	0.033	49.189	0.819
				0.985	= Y Avg		48.370	ΔH@ Avg

Pass/Fail Result: Pass

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

Note: For ΔH_{sc}, orifice pressure differential that equates to 0.75cm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2inches (5.1mm) H₂O

Approved By: _____

(Paipasu Chaisana)
 Service Manager

WISDOM SCIENCE

บริษัท วิจัยและพัฒนาเทคโนโลยีแก๊สและเครื่องมือวัด
 WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

Date: 22-May-24

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Certificate of Calibration - Supplemental

METHOD 5 PRE-TEST CONSOLE CALIBRATION

Nomenclature

P_b - Barometric Pressure
 DGM - Dry Gas Meter
 K₁ - Constant based on standard temp and press
 t - Run time, in minutes
 P_m - ΔH (Meter Pressure, gauge)
 V_m - Volume collected by test meter, corrected for STP
 Q_{m(std)} - Calculated flow rate of test meter
 K' - Critical orifice coefficient
 P_w - Measured pressure of reference meter
 T_w - Temperature measured in reference meter
 T_m - Temperature measured in test meter
 Y - Ratio of volume collected from test meter and orifice
 sc - Scaling Factor
 Counts_{std} - Number of pulse counts, standardized
 Counts_{raw} - Number of raw pulse counts of a calibration run

Equations

$$V_{m(std)} = Y * K_1 \frac{V_w * (P_{bar} + \frac{P_{m(std)}}{1.315})}{T_w}$$

$$V_{m(std)} = Counts_{std} * Y_{sc(ave)}$$

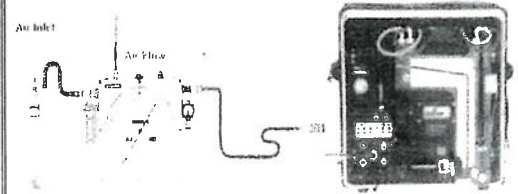
$$Counts_{std} = K_1 \frac{Counts_{total} * (P_{bar} + \frac{P_{m(std)}}{1.315})}{T_w}$$

$$Q_{m(std)} = \frac{V_{m(std)}}{t} \quad Y = \frac{V_{m(std)}}{Counts_{std}}$$

$$K_1 = \frac{T_{std}}{P_{std}} \quad Y = \frac{V_{m(std)}}{Counts_{std}}$$

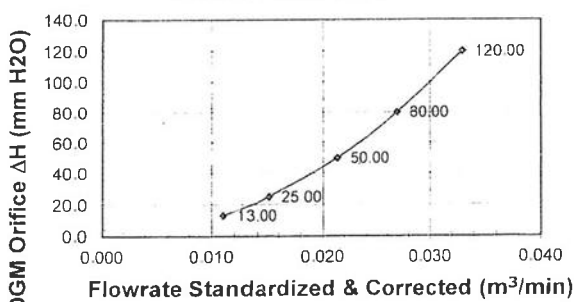
$$Metric \Delta H_{sc} = \frac{P_{m(std)} + 0.0011606 * (P_{m(std)} + \frac{P_{m(std)}}{1.315})}{T_w} \left(\frac{T_w}{T_{std}} \right)$$

Calibration Train



Calibration Graphs

Meter Pressure vs Flowrate

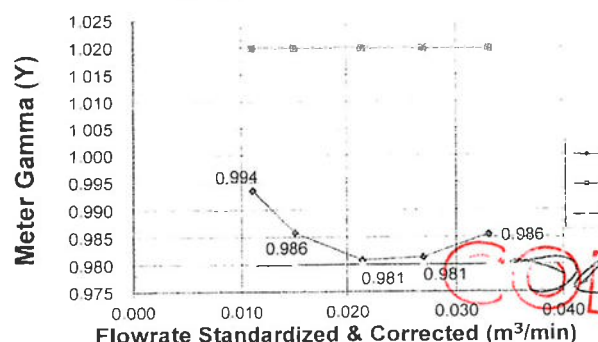


Console Serial: A2204323

Console Model: XC-572-

A-61

Meter Gamma vs Flowrate



Console Serial: A2204323

Console Model: XC-572-OV

TEMPERATURE DISPLAY CALIBRATION

Meter Console Information

Console Model	XC-572-OV
Console serial	A2204323
Temp Indicator Model	755-KF
Temp Indicator Serial	JC05830

Calibration Conditions

Cal Date	22-May-24
Due Date	22-May-25
Cal Report No	WDS-SV6704018
Ambient Temp (°C)	25
Pressure (mm Hg)	758
Humidity (%)	60

Reference Equipment

Temp Meter Model	Fuke 714B
Serial No	60590035
Cal Date	07-Apr-24
Temp Meter Model	Fuke 179
Serial No	58520112
Cal Date	08-Feb-24

Temperature Sensor Calibration

Reference Point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
1	-18.0	-17.0	1.0
2	38.0	37.0	1.0
3	93.0	93.0	0.0
4	149.0	150.0	-1.0
5	260.0	259.0	1.0
6	371.0	372.0	-1.0
7	482.0	482.0	0.0
8	593.0	593.0	0.0
9	816.0	815.0	1.0
10	1038.0	1038.0	0.0
Maximum			1.0

Note

* For valid test results, the maximum difference between temperature readings should $\leq 1.0^{\circ}\text{C}$ (EPA Method 5, Section 6.1.1.8)
Perform all TC Channel calibrations. Except meter (DGM) channel

PASS

DGM Out Temperature Sensor Calibration

Temperature point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
Ice	0.0	1.0	-1.0
Ambient	27.5	27.0	0.5
Heat	108.6	109.0	-0.4
Difference Range			
Temp. Difference			$\pm 2^{\circ}\text{F}$ or $\pm 1^{\circ}\text{C}$

Note

The temperatures of the thermocouple and reference thermometers shall agree to within $\pm 2^{\circ}\text{F}$ (EPA Method 5, section 10.5)

PASS

Approved By :

Palpasu Chaisana
(Palpasu Chaisana)
Service Manager

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DRY GAS METER XC-572-V

Serial No. : 1110070



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SALE AND SERVICE GROUP COMPANY LIMITED

Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m3)

Meter Console Information

Console Model : XC-572-V
 Console serial : 1110070
 DGM Model #: SK25EX
 DGM Serial #: 00006432

Calibration Condition

Cal. Date: 28-Jun-24
 Due Date: 28-Jun-25
 Cal. Report No.: WDS-SV6706007
 Ambient Temp (°C): 25
 Pressure (mm Hg): 758
 Relative Humidity (%): 60

Factors/Conversion

Std. Temp. (°K): 298
 Std. Pressure (mm Hg): 760
 K₁ (K/mm Hg): 0.3857

Reference Equipment

WTM Model: W-NKoDa-5B WTM Cal. Due Date: Dec. 2024
 WTM Serial: 600245 Gamma: 1.0000

UUT Meter (DGM)					Reference Meter (WTM)				
Run Time (minutes)	DGM Orifice (mm H ₂ O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
15.00	13.0	239.7603	239.9212	27	27	63.63889	63.79843	27	27
10.00	25.0	239.9406	240.0979	27	27	63.81777	63.97353	27	27
8.00	50.0	240.1147	240.2952	27	28	63.99028	64.16968	26	26
7.00	80.0	240.3308	240.5352	28	28	64.20536	64.40956	26	26
5.00	120.0	240.5641	240.7422	29	29	64.43852	64.61730	26	26

Standardized Data				Calibration Results				
Test Meter		Reference Meter		Correction Factor		Flow Rate	ΔH@ (mm H ₂ O)	
Std. Volume V _{std} (m ³)	Std. Flow Rate Q _{std} (m ³ /min)	Std. Volume V _{ref} (m ³)	Std. Flow Rate Q _{ref} (m ³ /min)	"Gamma" (Y)	Variation (ΔY)	Std & Corr Q _{std} (m ³ /min)	0.0212 SCMM ΔH _{sc}	Variation ΔΔH _{sc}
0.157	0.010	0.155	0.010	0.991	-0.003	0.010	53.303	6.250
0.154	0.015	0.152	0.015	0.989	-0.005	0.015	47.860	0.807
0.176	0.022	0.175	0.022	0.993	-0.001	0.022	46.233	-0.820
0.200	0.029	0.199	0.028	0.997	0.003	0.028	43.895	-3.158
0.174	0.035	0.175	0.035	1.001	0.007	0.035	43.973	-3.080
				0.994	= Y Avg.		47.053	= ΔH@ Avg.

Pass/Fail Result: Pass

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.

Note: For ΔH_{sc}, orifice pressure differential that equates to 0.75cfm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2inches (5.1mm) H₂O.

Approved By: _____

(Patpasu Chaisana)
 Service Manager

WISDOM SCIENCE

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 WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

Date: 28-Jun-24

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Certificate of Calibration - Supplemental

METHOD 5 PRE-TEST CONSOLE CALIBRATION

Nomenclature

P_b - Barometric Pressure
 DGM - Dry Gas Meter
 K₁ - Constant based on standard temp and press
 θ - Run time, in minutes
 P_m - ΔH (Meter Pressure, gauge)
 V_m - Volume collected by test meter, corrected for STP
 Q_{m(std)} - Calculated flow rate of test meter
 K' - Critical orifice coefficient
 P_{ref} - Measured pressure of reference meter
 T_m - Temperature measured in reference meter
 T_{std} - Temperature measured in test meter
 Y - Ratio of volume collected from test meter and orifice
 sc - Scaling Factor
 Counts_{std} - Number of pulse counts, standardized
 Counts_{total} - Number of raw pulse counts of a calibration run

Equations

$$V_{w(std)} = Y * K_1 \frac{V_w * (P_{bar} + \frac{P_{m(std)}}{13.6})}{T_w}$$

$$V_{m(std)} = Counts_{std} * Y_{sc(avg)}$$

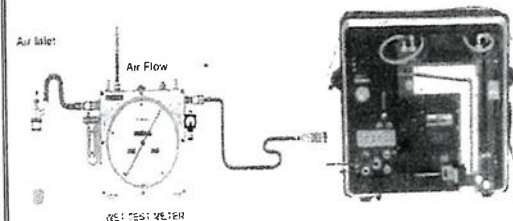
$$Counts_{std} = K_1 \frac{Counts_{total} * (P_{bar} + \frac{P_{m(std)}}{13.6})}{T_m}$$

$$Q_{w(std)} = \frac{V_{w(std)}}{\theta} \quad Y_{sc} = \frac{V_{m(std)}}{Counts_{std}}$$

$$K_1 = \frac{T_{std}}{P_{std}} \quad Y = \frac{V_{w(std)}}{V_{m(std)}}$$

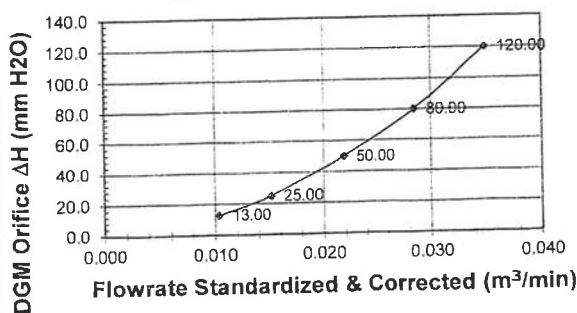
$$\Delta H_{true} = \frac{P_{m(std)} + 0.00116 * Q_{std}^2 * (P_{bar} + \frac{P_{m(std)}}{13.6})}{T_w} * \left(\frac{T_w + \theta}{T_{std} + P_{std}} \right)$$

Calibration Train



Calibration Graphs

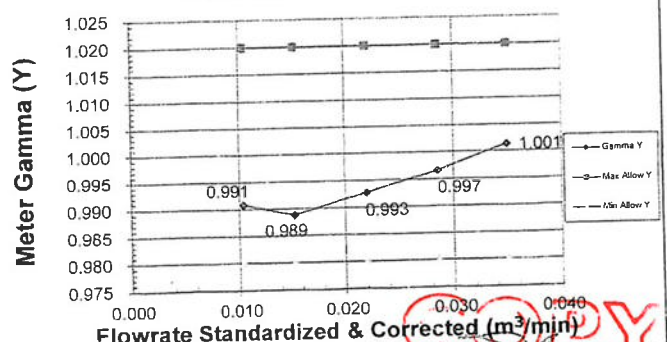
Meter Pressure vs Flowrate



Console Serial: 1110070

Console Model: XC-572-V

Meter Gamma vs Flowrate



Console Serial: 1110070

Console Model: XC-572-V

TEMPERATURE DISPLAY CALIBRATION

Meter Console Information

Console Model : XC-572-V
Console serial : 1110070
Temp Indicator Model : ID-85
Temp Indicator Serial :

Calibration Conditions

Cal. Date : 28-Jun-24
Due Date : 28-Jun-25
Cal. Report No. : WDS-SV6706007
Ambient Temp. (°C) : 25
Pressure (mm Hg) : 759
Humidity (%) : 60

Reference Equipment

Temp. Meter Model : Fluke 714B
Serial No. : 60590035
Cal. Date : 07-Apr-24
Temp. Meter Model : Fluke 179
Serial No. : 58620112
Cal. Date : 06-Feb-24

Temperature Sensor Calibration

Reference Point	Ref. Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
1	-18.0	-17.0	1.0
2	38.0	39.0	-1.0
3	93.0	94.0	-1.0
4	149.0	150.0	-1.0
5	260.0	261.0	-1.0
6	371.0	372.0	-1.0
7	482.0	483.0	-1.0
8	593.0	593.0	0.0
9	815.0	815.0	0.0
10	1038.0	1038.0	0.0
Maximum ¹			1.0

Note

¹ For valid test results, the maximum difference between temperature readings should be $\pm 1.0^{\circ}\text{C}$ (EPA Method 5, Section 6.1.1.8).
Perform all TC Channel calibrations. Except meter (DGM) channel

PASS

DGM Out Temperature Sensor Calibration

Temperature point	Ref. Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
Ice	1.0	2.0	-1.0
Ambient	24.2	25.0	-0.8
Heat	110.5	111.0	-0.5
Difference Range			
Temp. Difference			$\pm 2^{\circ}\text{F}$ or $\pm 1.1^{\circ}\text{C}$

Note

The temperatures of the thermocouple and reference thermometers shall agree to within $\pm 2^{\circ}\text{F}$. (EPA Method 5, section 10.5)

PASS

Approved By :

Patbasu Chaisana
(Patbasu Chaisana)

Service Manager

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WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

Address 9/115 Lumpini Town Villa Ratchaphruek-Phrak Village No. 4, Bang Khanun, Bang Kruai, Nonthaburi 11130 Thailand
Tel. 02-120-4122

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Flue gas Analyzer

Testo 350XL

Serial No. 01794619/002



Certificate No: G 670415
Date of issue : 25-Jun-24

Instrument description : Flue Gas Analyzer
Instrument model : Testo 350XL
Control unit serial no. : 01794619/002
Instrument serial no. : 01807527/002
ID no. or control no. : -
Manufacturer : Testo SE & Co. KGaA
Probe description : -
Probe model : -
Probe serial no. : -
Customer name : Eastern Thal Consulting 1992 Company Limited
Customer address : 683 Moo 11, Sukhapibarn 8 Road, Nongkham, Si Racha, Chon Buri 20280

Total pages of certificate : 2 Pages
Receiving no. : L-242269
Receiving date. : 19-Jun-24
Parameter of calibration : Gas Calibration(Oxygen 2.50,10.04,21.02 %vol, Carbon Monoxide 80.18,302,1001 ppm, Nitrogen Dioxide 30.34,81.32, 201.9 ppm, Nitric Oxide 30.01, 151.5, 322.5 ppm, Sulphur Dioxide 50.36, 100.8, 600.8 ppm)

Condition of UUC. : Used
Ambient condition : All of the Measurement were carried out the stabilized labortory
Temperature : 23 ±5 °C
Humidity : 55 ± 15 %RH
Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210
Calibration procedure no. : 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 measurment 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 : 24-Jun-24

Mr. Kwanchai Khandoung
Calibration Technician

Mrs. Nongnuch Hamfalfa
Technical Manager



Certificate No.: G 670415

Standard References (Table 1)

Standard	Certificate No.	Vendor	Due date
Oxygen (O2) 2.50 % Vol	2412/23	Linde	27-Aug-27
Oxygen (O2) 10.04 % Vol	CG-0153-21	Nimt	18-Nov-26
Oxygen (O2) 21.02 % Vol	CG-0041-22	Nimt	10-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-0085-24	Nimt	22-May-29
Nitrogen Dioxide (NO2) 30.34 ppm	2703/22	Linde	22-Aug-24
Nitrogen Dioxide (NO2) 81.32 ppm	3546/23	Linde	14-Jan-26
Nitrogen Dioxide (NO2) 201.9 ppm	1975/23	Linde	17-Jul-25
Nitric Oxide (NO) 30.01 ppm	CG-0014-23	Nimt	19-Feb-25
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 (SO2) 50.36 ppm	2004/23	Linde	17-Jul-25
Sulphur Dioxide (SO2) 100.8 ppm	3507/22	Linde	09-Nov-24
Sulphur Dioxide (SO2) 600.8 ppm	2003/23	Linde	17-Jul-25

Measured room conditions

Temperature : 24.1 °C Humidity : 62.8 %RH Pressure : 1009.9 mbar

Calibration conditions

Gas Temperature : 24 °C Flow rate : 1,000 ml/min Gas pressure : 1014.7 mbar

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (±)
O2 (%Vol)	2.50	2.48	-0.02	0.15
O2 (%Vol)	10.04	9.93	-0.11	0.20
O2 (%Vol)	21.02	21.11	0.09	0.30
CO (ppm)	80.18	81	0.82	3.0
CO (ppm)	302	302	0	6.0
CO (ppm)	1001	1002	1	12
NO2 (ppm)	30.34	31.5	1.16	8.0
NO2 (ppm)	81.32	82.3	0.98	8.0
NO2 (ppm)	201.9	201.2	-0.7	12
NO (ppm)	30.01	32	1.99	8.0
NO (ppm)	151.5	155	3.5	8.0
NO (ppm)	322.5	327	4.5	12
SO2 (ppm)	50.36	49	-1.36	6.0
SO2 (ppm)	100.8	100	-0.8	6.0
SO2 (ppm)	600.8	602	1.2	13

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

End of Report



Hot Air Oven

Model : UFE 500

Serial No. : G511.0182



CERTIFICATE OF CALIBRATION

Page 1 of 3

Certificate No. : 23-148804

Sample Code : 23-56200-006

Customer

: EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Sriacha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert Model : UFE 500

Serial No. : G511.0182 ID No. : LABE T7/4

Date of Receipt : 22 December 2023 Date of Calibration : 22 December 2023

Condition of Calibration

1. Environment	1.1 Ambient temperature	: Maximum	30.9 °C	: Minimum	29.6 °C
	1.2 Relative humidity	: Maximum	54.5 %	: Minimum	46.8 %
	1.3 Line voltage supplied	: Maximum	227.6 VAC	: Minimum	224.2 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-PH00)	LB-DA-08	23-084070	06 August 2024

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by

Mr. Pisek Into

Scientist

Approved by

(Mr. Somchai Neampunt)

Signed for Director

Issue date

25 December 2023

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

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

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 is traceable to recognized national standards and to the unit of measurement realized at the corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of the Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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Phlabphla, Wang Thonglang, Bangkok 10310

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TEL 02-516-2422

FAX 02-516-6949

Rev. 01

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date 15/10/21



REPORT OF CALIBRATION

Page 2 of 3

Certificate No. : 23-148804

Sample Code : 23-56200-006

Results of Calibration

Resolution : 0.5 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k	
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8			# 9 ^{ref}
104	103.5	103.5	104.11	103.94	103.85	103.84	103.97	103.93	103.64	103.51	104.23	0.47	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
104	0.04	0.78	0.81

Notes

UUC* = Unit Under Calibration

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361 Soi Ladprao 122, Ladprao Road,

Phlabphla, Wang Thonglang, Bangkok 10310

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TEL 02-516-2422

FAX 02-516-6949

Rev. 09

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WWW.AMARC.CO.TH

Effective Date 15/10/21

REPORT OF CALIBRATION

Page 3 of 3

Certificate No. : 23-148804

Sample Code : 23-56200-006

Results of Calibration

Notes

- Sensor installation locations
 - All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - The reference sensor is preferably located of the geometric center of the chamber.
- Interior dimensions approx of chamber :
W = 56 cm ; D = 40 cm ; H = 48 cm
- Air valve or fresh air level : Off
- Fan level : Open
- The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
- 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.
- Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
- Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
- UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
- Calibration results without adjustment.

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%. The standard uncertainty of measurement has been determined in accordance with UKAS MD003

- End of Report -

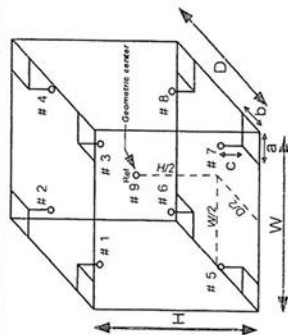


Figure: Example of sensor installation Positions

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ICP-OES/Avio550

Serial No. : M81S2210101

ICP-OES/Avio550 Preventive Maintenance (PM)

Company Name:		Eastern Thai Consulting 1992 Co., Ltd.	
Address (Instrument Location):		683 Moo 11 Sukhapibarn 8 Rd., Siracha, Chon Buri 20230	
Serial Number:	M8152210101	PM Number:	1 OF 2 W
Customer Name (if applicable):	K.Nunnaphat	Telephone Number:	038 481 197
Service Engineer Name:	K.Piyawit	Service Order Number:	WO-02754304
Date PM Performed: (DD-MM-YYYY)	25-Apr-2024	Next PM Due Date: (DD-MM-YYYY)	25-Oct-2024
Standard Labor Hours to Complete PM :		4 hours	

Part Number	Release	Publication Date
TH09370188 Rev.2	B	July 2020

Scope

The purpose of this PM is to ensure the continued functionality of the PerkinElmer / Avio550 by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.
Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
Avio550Max	M8152210101	Syngistix 5.1.0.0293

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
09995098	Air Filter-Spectrometer	N/A
N077520	Air Filter-RF Generator	N/A
09992731	Axial Window	N/A
B0810377	Radial Window	N/A
N0770438	O-ring kit, injector support adapter	N/A
N0780437	O-ring kit, torch	N/A

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N0691579	Muti-Element Standard	AR	61-176CRX1	30-JUN-2025
N9300221	DL Standard diluted 100 X	AR	59-091CRY1	30-JUN-2024
N0582152	Wave Cal Solution	AR	59-150CRX1	30-SEP-2024
N9302946	V/S Wavecal Solution	AR	59-113CRT1	28-FEB-2025

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Ask customer about unit's performance since last visit.
- ☒ Check incoming AC line voltage under load for proper levels and grounding.
- ☒ Is the instrument operational? If not, please comment.

2. Mechanical:

- ☒ Inspect and clean all fans and filters.
- ☒ Inspect and replace torch components and necessary.
- ☒ Inspect all tubing for signs of cracking or leaking and replace as necessary.

Torch Components Replaced: ☐ Yes ☒ No
 Tubing Replaced: ☒ Yes ☐ No
- ☒ Inspect the peristaltic pump for proper operation.
- ☒ Check and adjust if necessary, the external nitrogen, argon shear gas and water supply pressures.
- ☒ Check and adjust if necessary, the internal nitrogen, main argon, torch argon and shear gas pressures.

Regulator	Measured Pressure	Set Pressure
Nitrogen		NA (calibrated in Factory)
Main Argon	76 psig	76 psig
Torch Argon	67 psig	67 psig
Shear Gas	65 psig	65 psig
Water	35 psig	35 psig

- ☒ Check shear gas nozzle for blockages and proper, uniform flow.
- ☒ Inspect nitrogen H/Low purge and shear gas solenoids for proper function.
- ☒ Inspect the function of all spectrometer motors. Drive the motors from the Spectrometer DCM. (slits, XY motor)
- ☒ Inspect the function of the pneumatic shutter for proper operation.
- ☒ Perform preventative maintenance on the chiller as required. Make the customer aware of the importance of maintaining the chiller fluid level and filter replacement.
- ☒ Drain air compressor surge tank.
- ☒ Clean exterior of instrument.
- ☒ Visually inspect all PC boards for cleanliness and signs of corrosion.

3. Electrical

- ☒ Check all RF generator and spectrometer power supply voltages.
- ☒ Run instrument diagnostic checks from the appropriate Device Control Module.

RF Generator:

- ☒ Check the RF generator status screens.
- ☒ Check the function of all interlocks.

Spectrometer:

- ☒ Check the spectrometer status screens. Ensure Ready mode with no fatal errors.
- ☒ Check the spectrometer optical tube temperatures (top, bottom, fin, optical base).
- ☒ Check detector temperatures.
- ☒ Check TEC voltages (6.5VDC)

4. Optical:

- ☒ Clean or replace the axial and radial view windows as necessary.
- Axial Window Replaced: ☐ Yes ☒ No
- Radial Window Replaced: ☐ Yes ☒ No

5. PM Performance Tests:

- ☒ Perform View Align.

Test Spectral Resolution:

- ☒ Measure the spectrometers ability to separate two adjacent wavelengths.

Parameter	Specification	Test Result	Pass/Fail
As 193.696 - Resolution	≤0.007	0.00534	Passed
Ni 231.604 - Resolution	≤0.008	0.00725	Passed
Ni 341.476 - Resolution	≤0.012	0.00891	Passed
La 408.672 - Resolution	≤0.020	0.01603	Passed
Ba 455.403 - Resolution	≤0.025	0.02190	Passed

Test Precision:

- ☒ Test for reproducibility of a set of measurement.

Parameter	Specification	Test Result	Pass/Fail
As 193.696	%RSD ≤ 1 %	0.65%	Passed
Zn 213.856	%RSD ≤ 1 %	0.66%	Passed
Min 257.610	%RSD ≤ 1 %	0.41%	Passed
La 379.478	%RSD ≤ 1 %	0.51%	Passed
Ba 455.403	%RSD ≤ 1 %	0.32%	Passed
Ba 493.408	%RSD ≤ 1 %	0.30%	Passed

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☒ Run an Axial & Radial BEC according to the A&T spec.

Test Axial BEC Cd:

Method "BEC-XI" For Samples "IB (2% HNO_3)" and "IS (N930-0221/100)", record intensities.

Calculated BEC: $\text{BEC} = (\text{IB} * \text{Conc of Std}) / (\text{IS} - \text{IB})$. Where Conc of Std = 500 PPB

Element	Conc.	IB	IS	Spec	Pass/Fail
Cd 226	500	2,028.9	162,248.4		
IB* Conc	IS-IB	BEC			
1,014,450	160,219.5	6.33	<150 PPB		Passed

Test Radial BEC Mn:

Method "BEC-RL" For Samples "IB (2% HNO_3)" and "IS (N069-1579)", record intensities.

Calculated BEC: $\text{BEC} = (\text{IB} * \text{Conc of Std}) / (\text{IS} - \text{IB})$. Where Conc of Std = 1,000 PPB

Element	Conc.	IB	IS	Spec	Pass/Fail
Mn 257	1,000	2,166.8	91,410.0		
IB* Conc	IS-IB	BEC			
2,166,800	89,243.2	24.28	<45 PPB		Passed

6. Review:

- ☒ Review with the customer PM work performed.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for ICP-OES/Avio550 have been completed.

This ICP-OES/Avio550 Passes ☒ Fails ☐ the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:

Pujawati S.

Date:

25-Apr-2024
(DD-MMM-YYYY)

Authorized Customer Representative:

Date: 25-Apr-2024
(DD-MMM-YYYY)

COPY

IC-THERMO

Serial No. : 20053176

Certificate of Calibration
Integriion RFIC: Anion and Cation (ID#960)

ANALYTICAL BALANCE (DU)

Model : XS205DU

Serial No. : 1126323724

NSC-TIS-TIS17025
CALIBRATION 0152

Page 1 of 4

Certificate No. : 23-148799

Sample Code : 23-56200-001

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by Mr. Somwang Sangdee
Scientist

Issue date 25 December 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

NSC-TIS-TIS17025
CALIBRATION 0152

Page 2 of 4

Certificate No. : 23-148799

Sample Code : 23-56200-001

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Capacity : Max 81 g / 220 g

Resolution : 0.01 mg / 0.1 mg

Serial No. : 1126323724

ID No. : LABE 05/1

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 80	<input checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	40	80
<input checked="" type="checkbox"/> Adjustment	Standard weight	40.000054	80.000048
	Average reading of indicator	40.000026	80.000037
	Standard deviation	0.000015	0.000016

Unit : g	Range : 200	<input checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100	200
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042	200.000041
	Average reading of indicator	100.00003	200.00004
	Standard deviation	0.00005	0.00005



Certificate No. : 23-148799

Sample Code : 23-56200-001

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Range : 80 200

Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	1.00748	0	1.0274
40	0.98753	100	0.9975
80	0.99751	200	0.9975

3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.0000000	0.00000	0.00000	0.000012	2.05
0.01	0.0100025	0.01000	0.00000	0.000012	2.05
0.1	0.1000019	0.10001	-0.00001	0.000013	2.03
1	1.0000125	1.00001	0.00000	0.000015	2.02
5	5.0000208	5.00004	-0.00002	0.000021	2.00
10	10.0000004	10.00008	-0.00008	0.000026	2.00
20	20.0000030	20.00011	-0.00008	0.000036	2.00
50	50.0000014	50.00014	-0.00013	0.000068	2.00
100	100.0000042	100.0001	-0.0001	0.00016	2.00
150	150.0000056	150.0001	0.0000	0.00022	2.00
200	200.0000041	200.0002	-0.0002	0.00027	2.00

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

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Certificate No. : 23-148799

Sample Code : 23-56200-001

REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Weighing pan ☐ Circle☐ Triangular☒ Rectangular

Test weight : 50 and 100

Unit : g

Range 80 200

Position Reading of indicator

1 50.00015 100.0001

2 50.00022 100.0001

3 50.00008 100.0001

4 50.00002 100.0000

5 50.00016 100.0002

6 50.00014 100.0001

Maximum difference 0.00013 0.0001

Condition of Calibration

1. Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019

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

3. Condition of Calibration item: Normal

4. This certification is traceable to the International System of Unit maintained at : -

Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public

Company Limited (Instrument number 1).

5. Reference standard instrument :

Instrument

1) STANDARD WEIGHT 1 mg to 1 kg

Class E2

ID.No. LB-WE-79

Certificate No.

23-105642

Due Date

10 September 2024

- End of Report -

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BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD.
214 Bangwaek Rd. Bangpae Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Certificate No. : L202405022-0013

Date Issued : 08-May-24

Customer
: Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment
: Analog Barometer

Manufacturer
: Barigo
Model
: -
Serial No.
: -
ID No./Tag No.
: BM001/41
Date Received
: 03-May-24
Date Calibrated
: 06-May-24

Calibrated by
: Mr. Saruth Srichutikul

Calibration Method or Calibration Procedure Used

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

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

Result of Calibration

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

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

Approved by:
(Mr. Sarayuth Tochuva)

Page 1 of 2



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Certificate No : L202405022-0013

Environment
Ambient Temperature : $(25 \pm 2)^{\circ}\text{C}$
Relative Humidity : $(50 \pm 15)\%\text{RH}$

STD Reading	UUC Reading (mbar)	UUC Reading (mbar)	UUC Error	Uncertainty	NPE	Pass / Fail
mbar	Before Adjusted	After Adjusted	mbar	\pm mbar	\pm mbar	with Guard Band
990.00	990	-	0.00	0.59	10.3	Pass
1000.00	1000	-	0.00	0.59	10.3	Pass
1010.00	1010	-	0.00	0.59	10.3	Pass
1020.00	1020	-	0.00	0.59	10.3	Pass
1030.00	1030	-	0.00	0.59	10.3	Pass

STD = Standard Pass = $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$

UUC = Unit Under Calibration Fail = $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

MPE = Maximum Permissible Error

Calibrated condition : Pressure Medium Air : Density = 1.19 kg/m^3 @ 20°C , 1 bar
Mounting Position Vertical
Reference Level at center of its dial
Conversion Factor Multiply by 1.0 E+02 - Pa unit

Description of UUC :

Range	950 - 1080	mbar Absolute
Calibration Range	990 - 1030	mbar Absolute
Scale Interval	1	mbar

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

JRPC Certificate No. CLJ-P230097 (or Reference Pressure Monitor Serial No. 1598, Due 09-Nov-24)

End of Certificate

Page 2 of 2

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CERTIFICATE OF ANALYSIS

EPA PROTOCOL GAS

Cylinder No. : EB0145030

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E03N199E15AC0U4
Cylinder Number: EB0145030
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12021
Gas Code: CH4,PPN,BALN
Reference Number: 160-40224242-1
Cylinder Volume: 144.4 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 350
Certification Date: Oct 15, 2021
Expiration Date: Oct 15, 2029

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 800/R-12/001, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. This certificate contains significant information which affects the use of this calibration mixture. All concentrations are on a molar basis unless otherwise noted.

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
METHANE	180.0 PPM	177.0 PPM	G1	+/- 1.0% NIST Traceable
PROPANE	185.0 PPM	187.0 PPM	G1	+/- 1.0% NIST Traceable
NITROGEN	Balance			
CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
CONTRM	08011503	K002564	246.7 PPM METHANE/AIR	+/- 0.6%
CONTRM	200602-06	616260Y	243.3 PPM PROPANE/AIR	+/- 0.5%
ANALYTICAL EQUIPMENT				
Analytical Principle				
Instrument/Make/Model			Last Multipoint Calibration	
Nicolet IS50 FTIR AUP2110295 CH4			Oct 13, 2021	
Nicolet IS50 FTIR AUP2110295 C3H8			Oct 14, 2021	

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.0 Kg
Net Weight: 4.9 Kg
PO# 5221004861



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Michael A. Markes
Approved for Release

DRY GAS METER MC572V

Serial No. : 0504003

Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m3)

Meter Console Information

Console Model: MC572V
 Console serial: 0504003
 DGM Model #: SK25EX
 DGM Serial #: 00009854

Calibration Condition

Cal. Date: 22-Apr-24
 Due Date: 23-Apr-25
 Cal Report No.: WDS-SV6704001
 Ambient Temp (°C): 25
 Pressure (mm Hg): 758
 Relative Humidity (%): 60

Factors/Conversion

Std. Temp. (°K): 298
 Std. Pressure (mm Hg): 760
 K₁ (K/min Hg): 0.3857

Reference Equipment

WTM Model: W-NKoDa-5B WTM Cal. Due Date: Dec. 2023
 WTM Serial: 600245 Gamma: 1.0000

UUT Meter (DGM)					Reference Meter (WTM)				
Run Time (minutes)	DGM Orifice (mm H ₂ O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
0	P _{static}	V _{in}	V _{out}	T _{in}	T _{out}	V _{in}	V _{out}	T _{in}	T _{out}
15.00	13.0	144.5926	144.7699	26	27	60.06607	60.24392	29	28
10.00	25.0	144.8168	144.9795	27	27	60.29098	60.45472	27	27
8.00	50.0	145.0164	145.2002	28	28	60.49135	60.67317	29	27
7.00	80.0	145.2238	145.4291	28	28	60.69691	60.90186	29	28
5.00	120.0	145.4909	145.6692	28	29	60.96349	61.14145	27	26

Standardized Data				Calibration Results				
Test Meter		Reference Meter		Correction Factor		Flow Rate	VH@ (mm H ₂ O)	
Std. Volume	Std. Flow Rate	Std. Volume	Std. Flow Rate	"Gamma"	Variation	Std & Corr	0.0212 SCMM	Variation
V _{std} (m ³)	Q _{std} m ³ /min	V _{ref} (m ³)	Q _{ref} m ³ /min	(Y)	(ΔY)	Q _{std} m ³ /min	ΔH ₂	ΔΔH ₂
0.173	0.012	0.173	0.012	0.997	0.003	0.012	43.309	-0.858
0.159	0.016	0.160	0.016	1.004	0.011	0.016	43.381	-0.787
0.179	0.022	0.176	0.022	0.984	-0.009	0.022	45.447	1.280
0.201	0.029	0.199	0.028	0.989	-0.005	0.028	44.202	0.035
0.175	0.035	0.174	0.035	0.994	0.000	0.035	44.497	0.330
				0.993	= Y Avg			
							44.167	= ΔH@ Avg

Pass/Fail Result: **Pass**

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

Note: For ΔH₂, orifice pressure differential that equates to 0.75cfm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2 inches (5.1mm) H₂O

Approved By: _____

(Paipasu Chaisana)
 Service Manager

Date: 22-Apr-24

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Certificate of Calibration - Supplemental

METHOD 5 PRE-TEST CONSOLE CALIBRATION

Nomenclature

P₂ - Barometric Pressure
 DGM - Dry Gas Meter
 K₁ - Constant based on standard temp and press
 O - Run time, in minutes
 P_m - ΔH (Meter Pressure, gauge)
 V_m - Volume collected by test meter, corrected for STP
 Q_{m(std)} - Calculated flow rate of test meter
 K' - Critical orifice coefficient
 P_w - Measured pressure of reference meter
 T_w - Temperature measured in reference meter
 T_m - Temperature measured in test meter
 Y - Ratio of volume collected from test meter and orifice
 sc - Scaling Factor
 Counts_{sc} - Number of pulse counts, standardized
 C_{total} - Number of raw pulse counts of a calibration run

Equations

$$V_{m(std)} = Y * K_1 \frac{V_w - P_{w,sc} - \frac{P_w}{K_1}}{T_w}$$

$$V_{m(std)} = C'_{counts_{std}} * Y_{sc(avg)}$$

$$C'_{counts_{std}} = K_1 \frac{C_{counts} * (P_{w,sc} + \frac{P_w}{K_1})}{T_w}$$

$$Q_{m(std)} = \frac{V_{m(std)}}{t}$$

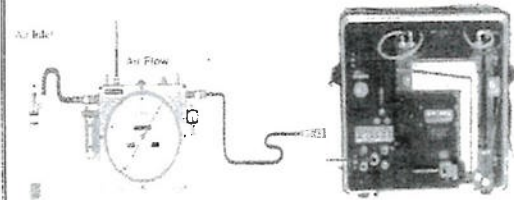
$$Y_{sc} = \frac{V_{m(std)}}{C'_{counts_{std}}}$$

$$K_1 = \frac{T_{std}}{P_{std}}$$

$$Y = \frac{V_{m(std)}}{V_{w(std)}}$$

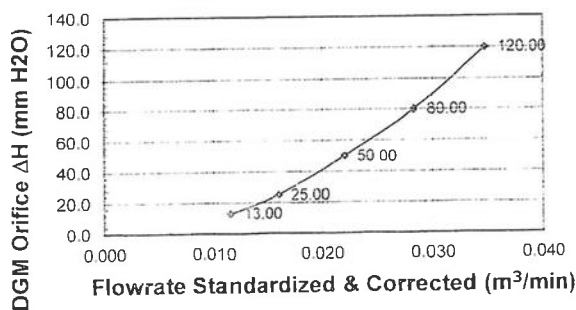
$$V_{w(std)} = \frac{P_{w,sc} - 0.0011326 * P_w + \frac{P_w}{K_1}}{T_w} \left(\frac{T_{std}}{T_w} \right)$$

Calibration Train



Calibration Graphs

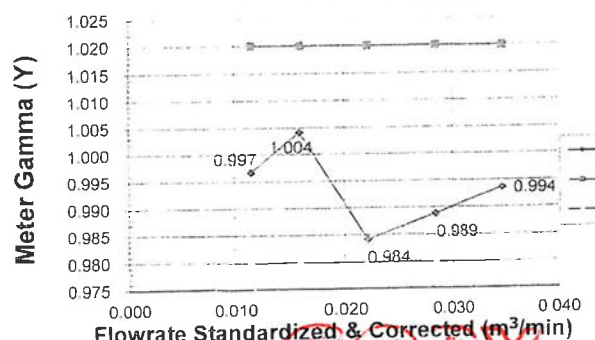
Meter Pressure vs Flowrate



Console Serial: 0504003

Console Model: MC572V

Meter Gamma vs Flowrate



Console Serial: 0504003

Console Model: MC572V



WISDOM SCIENCE

TEMPERATURE DISPLAY CALIBRATION

Meter Console Information

Console Model: MC572V
Console serial: 0504003
Temp Indicator Model: 755-KF
Temp Indicator Serial: JC05630

Calibration Conditions

Cal Date: 22-Apr-24
Due Date: 23-Apr-25
Cal Report No: WDS-SV6704001
Ambient Temp (°C): 25
Pressure (mm Hg): 758
Humidity (%): 60

Reference Equipment

Temp Meter Model: Fluke 714B
Serial No: 60590035
Cal Date: 07-Apr-24
Temp Meter Model: Fluke 179
Serial No: 5820112
Cal Date: 06-Feb-24

Temperature Sensor Calibration

Reference Point #	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
1	-18.0	-17.0	1.0
2	38.0	37.0	1.0
3	93.0	93.0	0.0
4	149.0	150.0	-1.0
5	260.0	259.0	1.0
6	371.0	372.0	-1.0
7	482.0	482.0	0.0
8	593.0	593.0	0.0
9	816.0	815.0	1.0
10	1038.0	1038.0	0.0
Maximum			1.0

Note

¹ For valid test results, the maximum difference between temperature readings should $\leq 1.0^{\circ}\text{C}$ (EPA Method 5, Section 6.1.1 b)
Perform all TC Channel calibrations. Except meter (DGM) channel

PASS

DGM Out Temperature Sensor Calibration

Temperature point #	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
Ice	0.0	1.0	-1.0
Ambient	26.5	26.0	0.5
Heat	109.3	110.0	-0.7

Difference Range

Temp. Difference $\pm 2^{\circ}\text{F}$ or $\pm 1^{\circ}\text{C}$

PASS

Note

The temperatures of the thermocouple and reference thermometers shall agree to within $\pm 2^{\circ}\text{F}$ (EPA Method 5, section 10.5)

Approved By:

(Paipasu Chaisana)

Service Manager

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DRY GAS METER XC-572-OV

Serial No. : A2204323



WISDOM SCIENCE

Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m3)

Meter Console Information

Console Model : XC-572-OV
 Console serial : A2204323
 DGM Model #: SK25EX
 DGM Serial #: 00008294

Calibration Condition

Cal. Date: 22-May-24
 Due Date: 22-May-25
 Cal. Report No.: WDS-SV6704018
 Ambient Temp (°C): 25
 Pressure (mm Hg): 758
 Relative Humidity (%): 60

Factors/Conversion

Std Temp (°K): 298
 Std. Pressure (mm Hg): 760
 K₁ (K/mm Hg): 0.3857

Reference Equipment

WTM Model: W-NKoDa-5B WTM Cal. Due Date: Dec, 2024
 WTM Serial: 600245 Gamma: 1.0000

Run Time (minutes)	DGM Orifice (mm H ₂ O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
0	P _{min}	V _{in}	V _{out}	T _{in}	T _{out}	V _{in}	V _{out}	T _{in}	T _{out}
15.00	13.0	194.6567	194.8274	26	27	61.39400	61.56423	28	27
10.00	25.0	195.0941	195.2514	28	28	61.82541	61.98088	29	28
8.00	50.0	195.2786	195.4572	28	28	62.00769	62.18342	28	27
7.00	80.0	195.4877	195.6846	28	29	62.21353	62.40748	28	27
5.00	120.0	195.7085	195.8796	29	29	62.43108	62.60020	26	27

Test Meter		Reference Meter		Correction Factor		Calibration Results		Flow Rate	
Std. Volume	Std. Flow Rate	Std. Volume	Std. Flow Rate	"Gamma"	Variation	Std & Corr	0.0212 SCMM	Std & Corr	ΔH@ (mm H ₂ O)
V _{std} (m ³)	Q _{std} m ³ /min	V _{std} (m ³)	Q _{std} m ³ /min	(Y)	(ΔY)	Q _{std} m ³ /min	ΔH _{sc}	Q _{std} m ³ /min	ΔH _{sc}
0.167	0.011	0.166	0.011	0.994	0.008	0.011	47.022	-1.348	
0.153	0.015	0.151	0.015	0.986	0.000	0.015	48.311	-0.059	
0.174	0.022	0.171	0.021	0.981	-0.005	0.021	48.458	0.089	
0.192	0.027	0.189	0.027	0.981	-0.004	0.027	48.869	0.499	
0.167	0.033	0.165	0.033	0.986	0.000	0.033	49.189	0.819	
				0.985	= Y Avg			48.370	= ΔH@ Avg

Pass/Fail Result: Pass

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

Note: For ΔH_{sc}, orifice pressure differential that equates to 0.75cfm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2inches (5.1mm) H₂O

Approved By:

(Paipasu Chaisana)
 Service Manager

WISDOM SCIENCE

บริษัท วิสโดม ไซนส์ แอนด์ เซอร์วิส จำกัด
 WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

Date

22-May-24

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Certificate of Calibration - Supplemental

METHOD 5 PRE-TEST CONSOLE CALIBRATION

Nomenclature

P_b - Barometric Pressure
 DGM - Dry Gas Meter
 K₁ - Constant based on standard temp and press
 t - Run time, in minutes
 P_{in} - ΔH (Meter Pressure, gauge)
 V_m - Volume collected by test meter, corrected for STP
 Q_{mstd} - Calculated flow rate of test meter
 K' - Critical orifice coefficient
 P_w - Measured pressure of reference meter
 T_w - Temperature measured in reference meter
 T_m - Temperature measured in test meter
 Y - Ratio of volume collected from test meter and orifice
 sc - Scaling Factor
 Counts_{std} - Number of pulse counts, standardized
 Counts_{raw} - Number of raw pulse counts of a calibration run

Equations

$$V_{m(std)} = Y * K_1 \frac{V_w * (P_{bar} + \frac{P_{w(std)}}{1.36})}{T_w}$$

$$V_{m(std)} = Counts_{std} * Y_{sc(avg)}$$

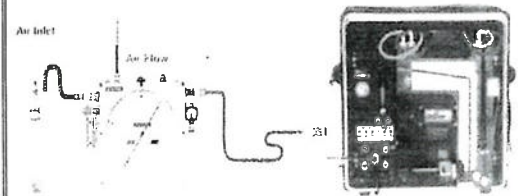
$$Counts_{std} = K_1 \frac{Counts * (P_{bar} + \frac{P_{w(std)}}{1.36})}{T_w}$$

$$Q_{mstd} = \frac{V_{m(std)}}{t}$$

$$K_1 = \frac{T_{std}}{P_{std}}$$

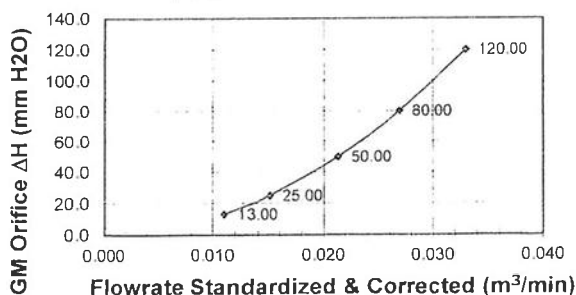
$$Metric \Delta H_{sc} = \frac{P_{w(std)} * 10.13696 * (P_{bar} + \frac{P_{w(std)}}{1.36})}{T_w} * (\frac{T_w}{T_{std}} - \frac{P_{std}}{P_{w(std)}})$$

Calibration Train



Calibration Graphs

Meter Pressure vs Flowrate

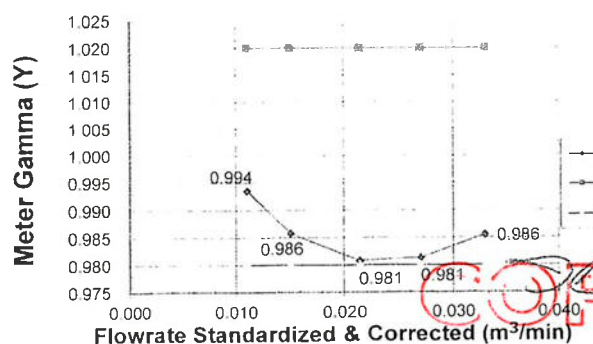


Console Serial: A2204323

Console Model: XC-572-OV

A-88

Meter Gamma vs Flowrate



Console Serial: A2204323

Console Model: XC-572-OV

TEMPERATURE DISPLAY CALIBRATION

Meter Console Information

Console Model	XC-572-OV
Console serial	A2204323
Temp Indicator Model	765-KF
Temp Indicator Serial	JC05630

Calibration Conditions

Cal Date	22-May-24
Due Date	22-May-25
Cal Report No	WDS-SV6704018
Ambient Temp (°C)	25
Pressure (mm Hg)	753
Humidity (%)	60

Reference Equipment

Temp Meter Model	Fuke 714B
Serial No	60590035
Cal Date	07-Apr-24
Temp Meter Model	Fuke 179
Serial No	58620112
Cal Date	06-Feb-24

Temperature Sensor Calibration

Reference Point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
1	-18.0	-17.0	1.0
2	38.0	37.0	1.0
3	93.0	93.0	0.0
4	149.0	150.0	-1.0
5	260.0	259.0	1.0
6	371.0	372.0	-1.0
7	482.0	482.0	0.0
8	593.0	593.0	0.0
9	816.0	815.0	1.0
10	1038.0	1038.0	0.0
Maximum			1.0

Note

* For valid test results, the maximum difference between temperature readings should $\leq 1.0^{\circ}\text{C}$ (EPA Method 5, Section 6.1.1.8)
Perform all TC Channel calibrations. Except meter (DGM) channel

PASS

DGM Out Temperature Sensor Calibration

Temperature point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
Ice	0.0	1.0	-1.0
Ambient	27.5	27.0	0.5
Heat	108.6	109.0	-0.4

Difference Range

Temp. Difference $\pm 2^{\circ}\text{F}$ or $\pm 1^{\circ}\text{C}$

PASS

Note

The temperatures of the thermocouple and reference thermometers shall agree to within $\pm 2^{\circ}\text{F}$ (EPA Method 5, section 10.5)

Approved By :

Patpasu Chalsana

(Patpasu Chalsana)

Service Manager

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DRY GAS METER XC-572-V

Serial No. : 1110070



Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m3)

Meter Console Information

Console Model : XC-572-V
Console serial : 1110070
DGM Model #: SK25EX
DGM Serial #: 00006432

Calibration Condition

Cal. Date: 28-Jun-24
Due Date: 28-Jun-25
Cal. Report No.: WDS-SV6706007
Ambient Temp (°C): 25
Pressure (mm Hg): 758
Relative Humidity (%): 60

Factors/Conversion

Std. Temp. (°K): 298
Std. Pressure (mm Hg): 760
K₁ (K/mm Hg): 0.3857

Reference Equipment

WTM Model: W-NKoDa-5B WTM Cal. Due Date: Dec, 2024
WTM Serial: 600245 Gamma: 1.0000

UUT Meter (DGM)				Reference Meter (WTM)			
Run Time (minutes)	DGM Orifice (mm H ₂ O)	Volume		Outlet Temp		Volume	
		Initial	Final	Initial	Final	Initial	Final
θ	P _{m(g)}	V _{mi}	V _{mf}	t _{mi}	t _{mf}	V _{wi}	V _{wf}
15.00	13.0	239.7603	239.9212	27	27	63.63889	63.79843
10.00	25.0	239.9406	240.0979	27	27	63.81777	63.97353
8.00	50.0	240.1147	240.2952	27	28	63.99028	64.16968
7.00	80.0	240.3308	240.5352	28	28	64.20536	64.40956
5.00	120.0	240.5641	240.7422	29	29	64.43852	64.61730

Standardized Data

Test Meter		Reference Meter		Correction Factor		Flow Rate		ΔH@ (mm H ₂ O)
Std. Volume	Std. Flow Rate	Std. Volume	Std. Flow Rate	"Gamma"	Variation	Std & Corr	0.0212 SCMM	Variation
V _{std} (m ³)	Q _{std} (m ³ /min)	V _{ref} (m ³)	Q _{ref} (m ³ /min)	(Y)	(ΔY)	Q _{std} (corr)	ΔH _g	ΔΔH _g
0.157	0.010	0.155	0.010	0.991	-0.003	0.010	53.303	6.250
0.154	0.015	0.152	0.015	0.989	-0.005	0.015	47.860	0.807
0.176	0.022	0.175	0.022	0.993	-0.001	0.022	46.233	-0.820
0.200	0.029	0.199	0.028	0.997	0.003	0.028	43.895	-3.158
0.174	0.035	0.175	0.035	1.001	0.007	0.035	43.973	-3.080

0.994 = Y Avg.

47.053 = ΔH@ Avg.

Pass/Fail Result: **Pass**

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.

Note: For ΔH_g, orifice pressure differential that equates to 0.75cfm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2inches (5.1mm) H₂O.

Approved By:

Palpasu Chaisana

(Palpasu Chaisana)
Service Manager

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WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

Date: 28-Jun-24

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Certificate of Calibration - Supplemental

METHOD 5 PRE-TEST CONSOLE CALIBRATION

Nomenclature

P_b - Barometric Pressure
DGM - Dry Gas Meter
K₁ - Constant based on standard temp and press
θ - Run time, in minutes
P_m - ΔH (Meter Pressure, gauge)
V_m - Volume collected by test meter, corrected for STP
Q_{m(std)} - Calculated flow rate of test meter
K' - Critical orifice coefficient
P_w - Measured pressure of reference meter
t_w - Temperature measured in reference meter
t_m - Temperature measured in test meter
Y - Ratio of volume collected from test meter and orifice
sc - Scaling Factor
Counts_{std} - Number of pulse counts, standardized
C_{total} - Number of raw pulse counts of a calibration run

Equations

$$V_{w(std)} = Y * K_1 \frac{V_w * (P_{bar} + \frac{P_{m(std)}}{13.6})}{T_w}$$

$$V_{m(std)} = Counts_{std} * Y_{sc(avg)}$$

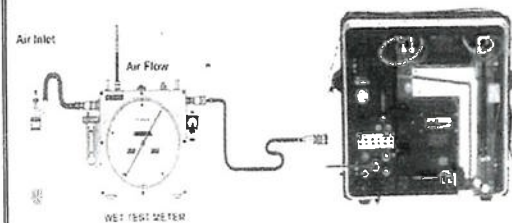
$$Counts_{std} = K_1 \frac{C_{total} * (P_{bar} + \frac{P_{m(std)}}{13.6})}{T_m}$$

$$Q_{w(std)} = \frac{V_{w(std)}}{\theta} \quad Y_{sc} = \frac{V_{w(std)}}{Counts_{std}}$$

$$K_1 = \frac{T_{std}}{P_{std}} \quad Y = \frac{V_{w(std)}}{V_{m(std)}}$$

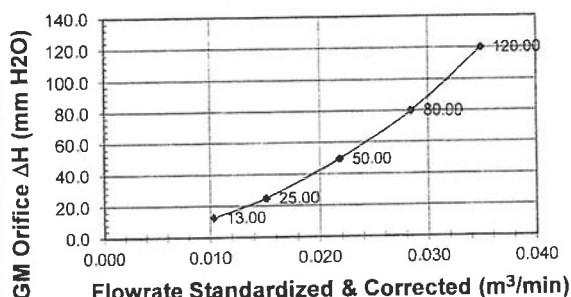
$$Metric \Delta H = \frac{P_{std} - 0.0011636 * (P_{m(std)} + \frac{P_{m(std)}}{13.6})}{T_{std}} \left(\frac{T_{std} * \theta}{V_{m(std)}} \right)^2$$

Calibration Train



Calibration Graphs

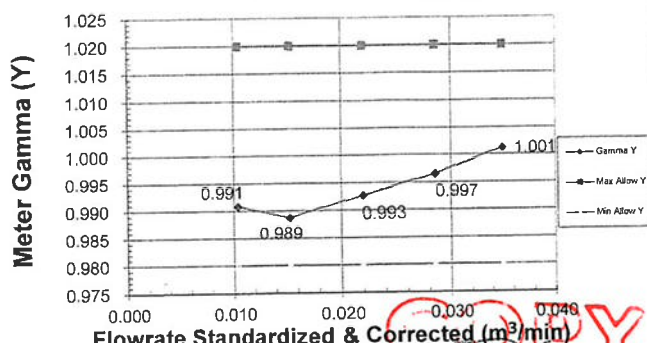
Meter Pressure vs Flowrate



Console Serial: 1110070

Console Model: XC-572-V

Meter Gamma vs Flowrate



Console Serial: 1110070

Console Model: XC-572-V

Meter Console Information

Console Model : XC-572-V
Console serial : 1110070
Temp Indicator Model : ID-85
Temp Indicator Serial : -

Calibration Conditions

Cal. Date : 28-Jun-24
Due Date : 28-Jun-25
Cal. Report No. : WDS-SV708007
Ambient Temp (°C) : 25
Pressure (mm Hg) : 758
Humidity (%) : 60

Reference Equipment

Temp. Meter Model : Fluke 714B
Serial No. : 60580035
Cal. Date : 07-Apr-24
Temp Meter Model : Fluke 179
Serial No. : 5820112
Cal. Date : 06-Feb-24

Temperature Sensor Calibration

Reference Point	Ref. Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
1	-18.0	-17.0	1.0
2	38.0	38.0	-1.0
3	93.0	94.0	-1.0
4	149.0	150.0	-1.0
5	260.0	261.0	-1.0
6	371.0	372.0	-1.0
7	482.0	483.0	-1.0
8	593.0	593.0	0.0
9	816.0	815.0	1.0
10	1038.0	1038.0	0.0
Maximum *			1.0

Note

* For valid test results, the maximum difference between temperature readings should $\leq 1.0^{\circ}\text{C}$ (EPA Method 5, Section 6.1.1.8).
Perform all TC Channel calibrations. Except meter (DGM) channel

PASS

DGM Out Temperature Sensor Calibration

Temperature point	Ref. Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
#			
Ice	1.0	2.0	-1.0
Ambient	24.2	25.0	-0.8
Heat	110.5	111.0	-0.5
Difference Range			
Temp. Difference	$\pm 2^{\circ}\text{F}$ or $\pm 1.1^{\circ}\text{C}$		

PASS

Note

The temperatures of the thermocouple and reference thermometers shall agree to within $\pm 2^{\circ}\text{F}$. (EPA Method 5, section 10.5)

Approved By :

(Signature)
(Palpasu Chaisana)
Service Manager

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DRY GAS METER MC-572-V

Serial No. : 1007055

Certificate Of Calibration

Method 5 Pre-Test Console Calibration - Cubic meter (m3)

Meter Console Information

Console Model : MC-572-V
 Console serial : 1007055
 DGM Model #: SK25EX
 DGM Serial #: 0009799

Calibration Condition

Cal. Date : 04-Aug-24
 Due Date : 04-Aug-25
 Cal. Report No : WDS-SV6707001
 Ambient Temp (°C) : 25
 Pressure (mm Hg) : 758
 Relative Humidity (%) : 60

Factors/Conversion

Std. Temp. (°K) : 298
 Std. Pressure (mm Hg) : 760
 K₁ (K/mm Hg) : 0.3857

Reference Equipment

WTM Model : W-NKoDa-58 WTM Cal. Due Date : Dec. 2024
 WTM Serial : 600245 Gamma : 1.0000

UUT Meter (DGM)					Reference Meter (WTM)				
Run Time (minutes)	DGM Orifice (mm H ₂ O)	Volume		Outlet Temp		Volume		Outlet Temp	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
s	P _{avg}	V _{int}	V _{ext}	t _{in}	t _{out}	V _{in}	V _{ext}	t _{in}	t _{out}
15.00	13.0	107.7550	107.9221	29	30	68.41024	68.57350	28	27
10.00	25.0	107.9308	108.0876	30	30	68.58202	68.73488	27	27
8.00	50.0	108.1027	108.2822	30	30	68.74958	68.92516	27	27
7.00	80.0	108.3029	108.5061	30	30	68.94550	69.14488	27	27
5.00	120.0	108.5139	108.6908	30	30	69.15251	69.32550	27	27

Standardized Data				Calibration Results				
Test Meter		Reference Meter		Correction Factor		Flow Rate	ΔH@ (mm H ₂ O)	
Std. Volume	Std. Flow Rate	Std. Volume	Std. Flow Rate	"Gamma"	Variation	Std & Corr	ΔH _{sc}	Variation
V _{m(Std)} (m ³)	Q _{m(Std)} m ³ /min	V _{r(Std)} (m ³)	Q _{r(Std)} m ³ /min	(Y)	(ΔY)	Q _{m(Std)(corr)}		ΔΔH _{sc}
0.162	0.011	0.159	0.011	0.982	0.006	0.011	50.751	2.535
0.152	0.015	0.149	0.015	0.982	0.001	0.015	49.300	1.084
0.174	0.022	0.171	0.021	0.983	0.002	0.021	48.061	-0.155
0.197	0.028	0.194	0.028	0.983	0.002	0.028	45.922	-2.293
0.173	0.035	0.169	0.034	0.976	-0.005	0.034	47.046	-1.170
				0.981	= Y Avg			
							48.216	= ΔH@ Avg

Pass/Fail Result: Pass

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

Note: For ΔH_{sc}, orifice pressure differential that equates to 0.75cfm (0.0212m³/min) at standard temperature and pressure, acceptable tolerance of individual values from the average is ±0.2 inches (5.1mm) H₂O

Approved By:

(Patpasu Chaisana)
 Service Manager

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 WISDOM SCIENCE SALE AND SERVICE GROUP COMPANY LIMITED

Date: 04-Aug-24

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Certificate of Calibration - Supplemental

METHOD 5 PRE-TEST CONSOLE CALIBRATION

Nomenclature

Equations

Calibration Train

P_b - Barometric Pressure
 DGM - Dry Gas Meter
 K₁ - Constant based on standard temp and press
 t - Run time, in minutes
 P_m - ΔH (Meter Pressure, gauge)
 V_m - Volume collected by test meter, corrected for STP
 Q_{m(Std)} - Calculated flow rate of test meter
 K' - Critical orifice coefficient
 P_r - Measured pressure of reference meter
 t_r - Temperature measured in reference meter
 t_m - Temperature measured in test meter
 Y - Ratio of volume collected from test meter and orifice
 sc - Scaling Factor
 Counts_{sc} - Number of pulse counts, standardized
 Counts_{total} - Number of raw pulse counts of a calibration run

$$V_{m(Std)} = Y * K_1 * \frac{V_m * (P_{bar} + \frac{P_m}{1.375})}{T_m}$$

$$V_{m(Std)} = Counts_{Std} * Y_{scaling}$$

$$Counts_{Std} = K_1 * \frac{Counts_{total} * (P_{bar} - \frac{P_m}{1.375})}{T_m}$$

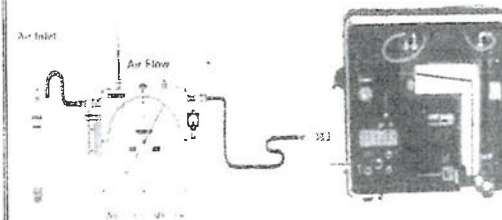
$$Q_{m(Std)} = \frac{V_{m(Std)}}{t}$$

$$Y_{sc} = \frac{V_{m(Std)}}{Counts_{sc}}$$

$$K_1 = \frac{T_{Std}}{P_{Std}}$$

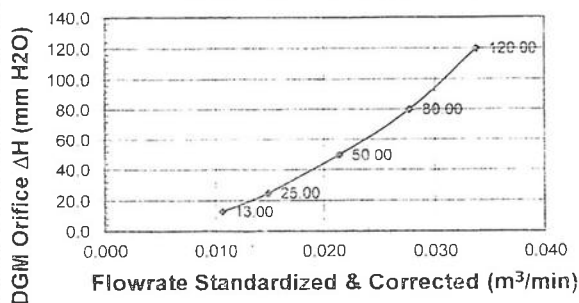
$$Y_{sc} = \frac{V_{m(Std)}}{Counts_{sc}}$$

$$V_{m(Std)} \Delta H = \frac{P_{m(Std)} * (1.375 * P_{m(Std)} + P_{bar})}{P_{m(Std)} * (1.375 * P_{m(Std)} + P_{bar})} * \left(\frac{1}{Y_{sc}} \right)$$



Calibration Graphs

Meter Pressure vs Flowrate

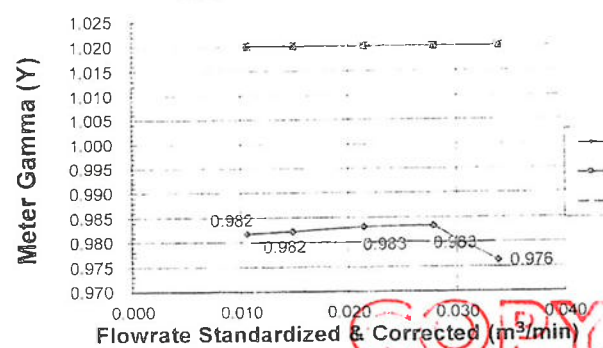


Console Serial: 1007055

Console Model: MC-572-V

MC-572-V

Meter Gamma vs Flowrate



Console Serial: 1007055

Console Model: MC-572-V

MC-572-V



WISDOM SCIENCE

TEMPERATURE DISPLAY CALIBRATION

Meter Console Information

Console Model	MC-572-V
Console serial	1007055
Temp Indicator Model	765-KF
Temp Indicator Serial	JC17852

Calibration Conditions

Cal Date	04-Aug-24
Due Date	04-Aug-25
Cal Report No.	WDS-SV8707001
Ambient Temp (°C)	25
Pressure (mm Hg)	758
Humidity (%)	60

Reference Equipment

Temp Meter Model	Fuke 714B
Serial No	80590035
Cal Date	07-Apr-24
Temp Meter Model	Fuke 179
Serial No	5820112
Cal Date	06-Feb-24

Temperature Sensor Calibration

Reference Point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
1	-18.0	-18.0	0.0
2	38.0	38.0	0.0
3	93.0	94.0	-1.0
4	149.0	149.0	0.0
5	260.0	261.0	-1.0
6	371.0	372.0	-1.0
7	482.0	482.0	0.0
8	593.0	593.0	0.0
9	816.0	816.0	0.0
10	1038.0	1038.0	0.0
Maximum			1.0

Note

* For valid test results, the maximum difference between temperature readings should $\leq 1.0^{\circ}\text{C}$ (EPA Method 5, Section 6.1.1.8).
Perform all TC Channel calibrations, Except meter (DGM) channel

PASS

DGM Out Temperature Sensor Calibration

Temperature point	Ref Thermometer Temperature °C	Thermocouple Display Temperature °C	Temperature Difference °C
Ice	0.0	0.0	0.0
Ambient	26.9	27.0	-0.1
Heat	114.5	115.0	-0.5
Difference Rang			
Temp. Difference	$\pm 2^{\circ}\text{F}$ or $\pm 1^{\circ}\text{C}$		

PASS

Note

The temperatures of the thermocouple and reference thermometers shall agree to within $\pm 2^{\circ}\text{F}$. (EPA Method 5, section 10.5)

Approved By :

Patrasu Chaisana

(Patpasu Chaisana)

Service Manager

WISDOM SCIENCE

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Flue gas Analyzer

Testo 350XL

Serial No. 01794619/002



Calibration Certificate

ENTECH
Difference For Greater Value

Certificate No: G 670415
Date of issue : 25-Jun-24

Instrument description : Flue Gas Analyzer
Instrument model : Testo 350XL
Control unit serial no. : 01794619/002
Instrument serial no. : 01807527/002
ID no. or control no. : -
Manufacturer : Testo SE & Co. KGaA
Probe description : -
Probe model : -
Probe serial no. : -
Customer name : Eastern Thai Consulting 1992 Company Limited
Customer address : 683 Moo 11, Sukthapibarn 8 Road, Nongkham, Si Racha, Chon Buri 20280

Total pages of certificate : 2 Pages
Receiving no. : L-242269
Receiving date. : 19-Jun-24
Parameter of calibration : Gas Calibration(Oxygen 2.50,10.04,21.02 %vol, Carbon Monoxide 80.18,302,1001 ppm, Nitrogen Dioxide 30.34,81.32, 201.9 ppm, Nitric Oxide 30.01, 151.5, 322.5 ppm, Sulphur Dioxide 50.36, 100.8, 600.8 ppm)

Condition of UUC. : Used
Ambient condition : All of the Measurement were carried out the stabilized laboratory
Temperature : 23 \pm 5 $^{\circ}$ C
Humidity : 55 \pm 15 %RH

Calibration place : 17/121 Soi Ngamwongwan 47 Yaek 48, Toongsonghong, Laksi, Bangkok 10210
Calibration procedure no. : 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 measurent 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 : 24-Jun-24
Kwanchal Khamdoung
Mrs. Nongnuch Hamfalfa
Calibration Technician
Technical Manager



ENTECH
Difference For Greater Value

Calibration Certificate

Certificate No.: G 670415

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-Nov-26
Oxygen (O ₂) 21.02 % Vol	CG-0041-22	Nimt	10-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-0085-24	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	1975/23	Linde	17-Jul-25
Nitric Oxide (NO) 30.01 ppm	CG-0014-23	Nimt	19-Feb-25
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 : 24.1 $^{\circ}$ C Humidity : 62.8 %RH Pressure : 1009.9 mbar
Calibration conditions
Gas Temperature : 24 $^{\circ}$ C Flow rate : 1,000 ml/min Gas pressure : 1014.7 mbar

Calibration Results (Without adjustment) (Table 2)

Parameter of Standard	Standard Values	Mean of UUC	Error	Uncertainty (\pm)
O ₂ (%Vol)	2.50	2.48	-0.02	0.15
O ₂ (%Vol)	10.04	9.93	-0.11	0.20
O ₂ (%Vol)	21.02	21.11	0.09	0.30
CO (ppm)	80.18	81	0.82	3.0
CO (ppm)	302	302	0	6.0
CO (ppm)	1001	1002	1	12
NO ₂ (ppm)	30.34	31.5	1.16	8.0
NO ₂ (ppm)	81.32	82.3	0.98	8.0
NO ₂ (ppm)	201.9	201.2	-0.7	12
NO (ppm)	30.01	32	1.99	8.0
NO (ppm)	151.5	155	3.5	8.0
NO (ppm)	322.5	327	4.5	12
SO ₂ (ppm)	50.36	49	-1.36	6.0
SO ₂ (ppm)	100.8	100	-0.8	6.0
SO ₂ (ppm)	600.8	602	1.2	13

Remark : 1 cmol/mol = 1 %vol. 1 μ mol/mol = 1 ppm.

End of Report



Hot Air Oven

Model : UFE 500

Serial No. : G511.0182



CERTIFICATE OF CALIBRATION

Page 1 of 3
Certificate No. : 23-148804
Sample Code : 23-56200-006

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapbarn 8 Rd., Nongkham,

Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.

(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert Model : UFE 500

Serial No. : G511.0182 ID No. : LABE 17/4

Date of Receipt : 22 December 2023 Date of Calibration : 22 December 2023

Condition of Calibration

1. Environment	1.1 Ambient temperature	: Maximum	30.9 °C	: Minimum	29.6 °C
	1.2 Relative humidity	: Maximum	54.5 %	: Minimum	46.8 %
	1.3 Line voltage supplied	: Maximum	227.6 VAC	: Minimum	224.2 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-P100)	LB-DA-08 (RTD-248 to RTD-256)	23-084070	06 August 2024

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by

Mr. Pisek Into
Scientist

Approved by

(Mr. Somchai Neamput)
Signed for Director

Issue date

25 December 2023

The uncertainties are for a confidence probability of approximately 95%.
The calibration result is applied only to the above calibrated item and was found accurate as shown on date and place of calibration only.

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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Rev 01

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WWW.AMARC.CO.TH
Effective Date 15/10/21



REPORT OF CALIBRATION

Page 2 of 3
Certificate No. : 23-148804
Sample Code : 23-56200-006

Results of Calibration

Resolution : 0.5 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k	
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8			
104	103.5	103.5	104.11	103.94	103.85	103.84	103.97	103.93	103.64	103.51	104.23	0.47	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
104	0.04	0.78	0.81

Notes

UUC* = Unit Under Calibration

Jan

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Effective Date 15/10/21

REPORT OF CALIBRATION

Page 3 of 3

Certificate No. : 23-148804

Sample Code : 23-56200-006

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 56 cm ; D = 40 cm ; H = 48 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

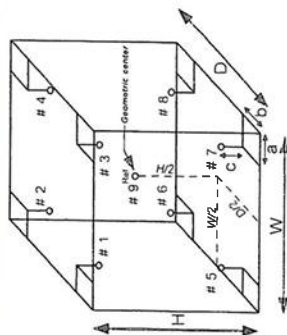


Figure: Example of sensor
Installation Positions

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

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ICP-OES/Avio550

Serial No. : M81S2210101

ICP-OES/Avio550 Preventive Maintenance (PM)

Company Name:		Eastern Thai Consulting 1992 Co., Ltd.	
Address		683 Moo 11 Sukhapibarn 8 Rd., Siracha, Chon Buri 20230	
(Instrument Location):			
Serial Number:	M8152210101	PM Number:	1 OF 2 W
Customer Name	K.Nunnaphat	Telephone	038 481 197
(if applicable):		Number:	
Service Engineer	K.Piyawit	Service Order	WO-02754304
Name:		Number:	
Date PM Performed:	25-Apr-2024	Next PM Due	25-Oct-2024
(DD-MMM-YYYY)		Date:	
		(DD-MMM-YYYY)	
Standard Labor Hours to Complete PM :		4 hours	

Part Number	Release	Publication Date
TH09370188 Rev.2	B	July 2020

**PerkinElmer**

Scope
The purpose of this PM is to ensure the continued functionality of the PerkinElmer / Avio550 by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

General Instructions:
The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.
Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
Avio550Max	M8152210101	Syngistix 5.1.0.0293

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
0995098	Air Filter-Spectrometer	N/A
N077520	Air Filter-RF Generator	N/A
09952731	Axial Window	N/A
B0810377	Radial Window	N/A
N0770438	O-ring kit, injector support adapter	N/A
N0780437	O-ring kit, torch	N/A

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N0691579	Muti-Element Standard	AR	61-176CRX1	30-JUN-2025
N9300221	DL Standard diluted 100 X	AR	59-091CRY1	30-JUN-2024
N0582152	Wave Cal Solution	AR	59-150CRX1	30-SEP-2024
N9302946	V/S Wavecal Solution	AR	59-113CRT1	28-FEB-2025

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Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ✓ Ask customer about unit's performance since last visit.
- ✓ Check incoming AC line voltage under load for proper levels and grounding.
- ✓ Is the instrument operational? If not, please comment.

2. Mechanical:

- ✓ Inspect and clean all fans and filters.
- ✓ Inspect and replace torch components and necessary.
- Torch Components Replaced: ☐ Yes ☒ No
- ✓ Inspect all tubing for signs of cracking or leaking and replace as necessary.
- Tubing Replaced: ☒ Yes ☐ No
- ✓ Inspect the peristaltic pump for proper operation.
- ✓ Check and adjust if necessary, the external nitrogen, argon shear gas and water supply pressures.
- ✓ Check and adjust if necessary, the internal nitrogen, main argon, torch argon and shear gas pressures.

Regulator	Measured Pressure	Set Pressure
Nitrogen		NA (calibrated in Factory)
Main Argon	76 psig	76 psig
Torch Argon	67 psig	67 psig
Shear Gas	65 psig	65 psig
Water	35 psig	35 psig

- ✓ Check shear gas nozzle for blockages and proper, uniform flow.
- ✓ Inspect nitrogen Hi/Low purge and shear gas solenoids for proper function.
- ✓ Inspect the function of all spectrometer motors. Drive the motors from the Spectrometer DCM. (slits, XY motor)
- ✓ Inspect the function of the pneumatic shutter for proper operation.
- ✓ Perform preventative maintenance on the chiller as required. Make the customer aware of the importance of maintaining the chiller fluid level and filter replacement.
- ✓ Drain air compressor surge tank.
- ✓ Clean exterior of instrument.
- ✓ Visually inspect all PC boards for cleanliness and signs of corrosion.

3. Electrical

- ✓ Check all RF generator and spectrometer power supply voltages.
- ✓ Run instrument diagnostic checks from the appropriate Device Control Module.

RF Generator:

- ✓ Check the RF generator status screens.
- ✓ Check the function of all interlocks.

Spectrometer:

- ✓ Check the spectrometer status screens. Ensure Ready mode with no fetal errors.
- ✓ Check the spectrometer optical tub temperatures (top, bottom, fin, optical base).
- ✓ Check detector temperatures.
- ✓ Check TEC voltages (6.5VDC)

4. Optical:

- ✓ Clean or replace the axial and radial view windows as necessary.
- Axial Window Replaced: ☐ Yes ☒ No
- Radial Window Replaced: ☐ Yes ☒ No

5. PM Performance Tests:

- ✓ Perform View Align.

Test Spectral Resolution:

- ✓ Measure the spectrometers ability to separate two adjacent wavelengths.

Parameter	Specification	Test Result	Pass/Fail
As 193.696 - Resolution	≤0.007	0.00534	Passed
Ni 231.604 - Resolution	≤0.008	0.00725	Passed
Ni 341.476 - Resolution	≤0.012	0.00891	Passed
La 408.672 - Resolution	≤0.020	0.01603	Passed
Ba 455.403 - Resolution	≤0.025	0.02190	Passed

Test Precision:

- ✓ Test for reproducibility of a set of measurement.

Parameter	Specification	Test Result	Pass/Fail
As 193.696	%RSD ≤ 1 %	0.65%	Passed
Zn 213.856	%RSD ≤ 1 %	0.66%	Passed
Mn 257.610	%RSD ≤ 1 %	0.41%	Passed
La 379.478	%RSD ≤ 1 %	0.51%	Passed
Ba 455.403	%RSD ≤ 1 %	0.32%	Passed
Ba 493.408	%RSD ≤ 1 %	0.30%	Passed

☒ Run an Axial & Radial BEC according to the A&T spec.

Test Axial BEC Cd:

Method "BEC-XL" For Samples "IB (2%HNO3)" and "IS (N930-0221/100)", record intensities.

Calculated BEC: $BEC = (IB * Conc of Std) / (IS * IB)$. Where Conc of Std = 500 PPB

Element	Conc.	IB	IS	Pass/Fail
Cd 226	500	2,028.9	162,248.4	
IB* Conc	IS-IB	BEC	Spec	
1,014,450	160,219.5	6.33	<150 PPB	Passed

Test Radial BEC Mn:

Method "BEC-RL" For Samples "IB (2%HNO3)" and "IS (N069-1579)", record intensities.

Calculated BEC: $BEC = (IB * Conc of Std) / (IS * IB)$. Where Conc of Std = 1,000 PPB

Element	Conc.	IB	IS	Pass/Fail
Mn 257	1,000	2,166.8	91,410.0	
IB* Conc	IS-IB	BEC	Spec	
2,166,800	89,243.2	24.28	<45 PPB	Passed

6. Review:

- ☒ Review with the customer PM work performed.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM

Review

The preventive maintenance checks and if applicable performance tests for ICP-OES/Avio550 have been completed.

This ICP-OES/Avio550 Passes ☒ Falls ☐ the preventive maintenance.

Review of Preventive Maintenance:

Authorized PerkinElmer Representative:

Pujawit S.

Date:

25-Apr-2024
(DD-MMM-YYYY)

Authorized Customer Representative:

Date:

25-Apr-2024
(DD-MMM-YYYY)

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UV/VIS SPECTROPHOTOMETER

Model : UV-1800

Serial No. : A11635101643 CD



Bara Scientific Co., Ltd.
968 U Chu Liang Building Floor 7 Rama4 Road
Silom Bangkok Bangkok Thailand 10500
Tel : 02-6324300 Fax : 02-6375496-7
www.barascientific.com



Certificate of Calibration

Number of Page(s) 1 of 3

Certificate No. BSCC-UV-146/24
Equipment UUV/Vis Spectrophotometer
Model UUV-1800
Manufacturer Shimadzu
Serial No. A11635101643 CD
ID No. LABE 03/2
Date of receipt 22 April 2024
Date of calibration 22 April 2024
Date of issue 29 April 2024
Customer name Eastern Thai Consulting 1992 Co., Ltd.
Address 683 Moo 11, Sukkaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Temperature (22.9-24.1) °C (On site)
Humidity (41.7-46.9) %RH (On site)

Equipment condition Good Operation

Calibration Location Analysis Department

Calibration Procedure In-house method WI-UV-702-01 based on ASTM E275-01

Traceability
Wavelength Accuracy is traceable to certificate No. 116614 and 116613
Photometric Accuracy is traceable to certificate No. 116210 and 116224
Stray Light is traceable to certificate No. 116616
The above certificate are traceable to SI unit through Siarna Scientific Ltd.
(UKAS accredited calibration laboratory NO. 0659)

Calibrated by Mr Poomjai Korsawatvorakul

Approved by

Mr. Sonthi Temboonsakdi
Service Manager

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Certificate of Calibration

Number of Page(s) 2 of 3

Certificate No. BSCC-UV-146/24

Calibration Results:

1. Wavelength Accuracy

Certified Wavelength (nm)	UUC (nm)	Error (nm)	Uncertainty (±nm)
287.71	287.75	0.04	0.18
445.82	445.89	0.07	0.18
536.52	536.50	-0.02	0.18
741.02	741.01	-0.01	0.18
879.41	879.33	-0.08	0.18

2. Photometric Accuracy (UV)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
235	0.0000	0.0000	0.0000	0.0075
	0.7415	0.7387	-0.0028	0.0075
257	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
313	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
350	0.0000	0.0000	0.0000	0.0075
	0.6406	0.6395	-0.0011	0.0075

*CNR = Customer not request

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Certificate of Calibration

Certificate No. BSCC-UV-146/24 Number of Page(s) 3 of 3

Calibration Results:

3. Photometric Accuracy (Visible)

Wavelength (nm)	Certified Absorbance (A)	UUC (A)	Error (A)	Uncertainty (±A)
420.0	0.0000	0.0000	0.0000	0.0042
	0.5715	0.5729	0.0014	0.0042
	0.7087	0.7087	0.0000	0.0042
	1.0987	1.1005	0.0018	0.0042
440.0	0.0000	0.0000	0.0000	0.0042
	0.5561	0.5578	0.0017	0.0042
	0.6968	0.6969	0.0001	0.0042
	1.0757	1.0774	0.0017	0.0042
465.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
546.1	0.0000	0.0000	0.0000	0.0042
	0.5193	0.5213	0.0020	0.0042
	0.6937	0.6940	0.0003	0.0042
	1.0411	1.0428	0.0017	0.0042
590.0	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
	CNR	CNR	CNR	CNR
635.0	0.0000	0.0000	0.0000	0.0042
	0.5605	0.5624	0.0019	0.0042
	0.7579	0.7583	0.0004	0.0042
	1.1131	1.1138	0.0007	0.0042

*CNR = Customer not request

4. Stray Light*

Standard cut-off wavelength (nm)	Unit Under Calibration(UUC)	
	Wavelength (nm)	Absorbance (A)
201.33±0.11nm	200.80	2.0111

The Stray light transmission reference is less than 1.0%T and Stray light absorbance reference is greater than 2.00A

*Stray Light not NSC-ONSC Accredited.

The measurement uncertainty is base on a standard uncertainty multiplied by a coverage factor k=2 providing a level of confidence of approximately 95%.

End of Certificate

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SOUND LEVEL CALIBRATOR

MODEL : NC-75

SERIAL No. : 34802645



Calibration Certificate

Equipment : SOUND CALIBRATOR
Manufacturer : RION
Model : NC-75
Serial No.: #4932645
ID No.:

Condition As Found : GOOD

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
SAHA GROUP INDUSTRIAL PARK, 683 MOO 11,
NONGKHAM, SIRACHA, CHONBURI 20230 THAILAND.

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

Received Date : 06 SEPTEMBER 2023
Calibration Date : 12 OCTOBER 2023
Date of Issue : 16 OCTOBER 2023

Calibrated by : Nathakorn Pisutpaisan

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

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Calibration Procedure : CP-AC-03

Calibration Method :

This equipment was calibrated by based on IEC-60942-2003 Standard.
The sound pressure level, frequency and total distortion of the sound calibrator was measured using the reference microphone.

Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL-BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL-BP 30/0267	13-FEB-24
Digital Multimeter	33461A	MY60024273	EEL-BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24
Audio Analyzer	AVR-3360A	V74B6069	EF-0012-23	10-FEB-24

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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T. Petchurai

Continuation of Calibration Certificate

Cert. No. : ACC23037
Job No. : VC56AC0097
Pages : 3 of 3

Result of calibration :

1. Sound pressure level

Specified sound pressure level (dB)	Measured value (dB)	Deviated value (dB)	Uncertainty (dB)	Acceptance limit (dB)
94	93.94	-0.06	0.14	0.40

2. Frequency

Specified Frequency (Hz)	Measured value (Hz)	Deviated value (%)	Uncertainty (%)	Acceptance limit (%)
1000	1000.0	0.0	0.1	1.0

3. Total distortion

Measured value (%)	Uncertainty (%)	Acceptance limit (%)
0.24	0.10	3.0

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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Y. Petcha

SOUND LEVEL METER

MODEL : NL-21

SERIAL No. : 00310458



SITHIPORN
ASSOCIATES

SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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



SITHIPORN ASSOCIATES CO., LTD.
CALIBRATION LABORATORY

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

Cert. No. : ACL24024
Pages : 1 of 9

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-21/ Microphone UC-52 / Preamplifier NH-21
Serial No.: 00310458 / 155215 / 11329
ID No.:

Condition As Found : GOOD

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
SAHA GROUP INDUSTRIAL PARK, 683 MOO 11,
NONGKHAM, SIRACHA, CHONBURI 20230 THAILAND.

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

Received Date : 18 DECEMBER 2023
Calibration Date : 10-11 JANUARY 2024
Date of Issue : 12 JANUARY 2024

Calibrated by : Nathakorn Pisutpaisan

Approved by : 
(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.



Cert. No. : ACL24024
Job No. : VC67AC0039
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 weighing 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 :

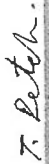
Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	EF-0009-23	07-FEB-24
Waveform Generator	33511B	MY52302742	EF-0010-23	07-FEB-24
Digital Multimeter	33461A	MY53220104	EEL.BP 30/0266	13-FEB-24
Digital Multimeter	33461A	MY53220076	EEL.BP 29/0266	13-FEB-24
Digital Multimeter	34461A	MY60024273	EEL.BP 31/0266	14-FEB-24
Programmable Attenuator	MAT-1070	62100114	EF-0011-23	08-FEB-24
Condenser Microphone	4180	2977900	AA-1001-23	14-FEB-24
Measuring Amplifier	NA-42KAI	34560495	AA-3002-23	14-FEB-24

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).





Summary of Measurement Result :

Parameter	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	0.2	N/A
2. Self-generated noise	0.4	N/A
3. Acoustical signal tests of frequency weightings		
125 Hz	0.3	0.6
1000 Hz	0.3	0.6
8000 Hz	0.3	0.7
4. Electrical signal tests of frequency weightings		
For 10 Hz to 4 kHz	0.3	0.6
For > 4 kHz to 10 kHz	0.3	0.7
For > 10 kHz to 20 kHz	-	1.0
5. Frequency and time weightings at 1 kHz	0.2	0.2
6. Long - term stability	0.1	0.1
7. Level linearity on the reference level range	0.2	0.3
8. Level linearity including the level range control	0.2	0.3
9. Tone burst response	0.2	0.3
10. Peak C sound level	0.2	0.35
11. Overload indication	0.2	0.25
12. High level stability	0.1	0.1

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7. Petch.

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.98)	93.9	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
23.4

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

Frequency Weighting	Measured value (dB)
A - weight	22.9
C - weight	24.4
Flat	30.6

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
125	-0.1	-0.1	-0.1
1000	-0.1	-0.1	-0.1
8000	-0.6	-0.5	-0.5

COPY

7. Petch.

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
63	-0.2	-0.1	-0.1
125	-0.2	0.0	-0.1
250	-0.1	0.0	-0.1
500	-0.1	0.0	-0.1
1000	0.0	0.0	0.0
2000	0.1	0.2	0.1
4000	0.1	0.1	0.1
8000	0.0	0.2	0.3

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	± 0.3

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
135.0	134.9	-0.1	± 1.1
134.0	133.9	-0.1	± 1.1
129.0	128.9	-0.1	± 1.1
124.0	123.9	-0.1	± 1.1
119.0	118.9	-0.1	± 1.1
114.0	113.9	-0.1	± 1.1
109.0	108.9	-0.1	± 1.1
104.0	103.9	-0.1	± 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

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7. Retain

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7. Retain

Cert. No. : ACL24024
Job No. : VC67AC0039
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
120	94.0	94.0	0.0	±1.1
110	94.0	94.0	0.0	±1.1
100	94.0	94.0	0.0	±1.1
90	94.0	94.0	0.0	±1.1

Level linearity on each level range

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	42.5	42.7	0.2	±1.1
120	32.5	32.5	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	128.0	0.0	±1.0

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T. Petch

Cert. No. : ACL24024
Job No. : VC67AC0039
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	132.6	-0.8	±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	-0.2	±1.5
89.5	89.3		

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T. Petch

Cert. No. : ACL24024
Job No. : VC67AC0039
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 _____

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SOUND LEVEL METER

MODEL : NL-21

SERIAL No. : 01209916

Cert. No. : ACL24115
Pages : 1 of 9

Calibration Certificate

Equipment : SOUND LEVEL METER
Manufacturer : RION
Model : NL-21 / Microphone UC-52 / Preamplifier NH-21
Serial No.: 01209916 / 167319 / 32087
ID No.: -

Condition As Found : GOOD

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
SAHA GROUP INDUSTRIAL PARK, 683 MOO 11,
NONGKHAM, SIRACHA, CHONBURI 20230 THAILAND.

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

Received Date : 29 MARCH 2024
Calibration Date : 24-26 APRIL 2024
Date of Issue : 29 APRIL 2024

Calibrated by : Nathakorn Pisulpaisan

Approved by : 
(Thanakul Petchuraj)

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.

Cert. No. : ACL24115
Job No. : VC67AC0072
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-0009-4	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).

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T. Petchuraj

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	-	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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J. Petchw.

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)
22.9

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

Frequency Weighting	Measured value (dB)
A - weight	22.6
C - weight	24.7
Flat	28.6

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
125	0.3	0.3	0.3
1000	0.1	0.1	0.1
8000	0.3	0.4	0.4

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J. Petchw.

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	-0.2	-0.3 ±2.0
125	-0.1	-0.1	-0.3 ±1.5
250	-0.1	0.0	-0.2 ±1.5
500	0.0	0.0	-0.1 ±1.5
1000	0.0	0.0	0.0 ±1.0
2000	0.1	0.1	0.1 ±2.0
4000	0.1	0.1	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	± 0.3

7. Level linearity on the reference level range

Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
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	88.9	-0.1	± 1.1
84.0	83.9	-0.1	± 1.1
79.0	78.9	-0.1	± 1.1
74.0	73.9	-0.1	± 1.1
69.0	68.9	-0.1	± 1.1
64.0	63.9	-0.1	± 1.1
59.0	58.9	-0.1	± 1.1
54.0	53.9	-0.1	± 1.1
49.0	48.9	-0.1	± 1.1
44.0	43.9	-0.1	± 1.1
39.0	38.7	-0.3	± 1.1

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T. Petchw.

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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
120	94.0	94.0	0.0	±1.1
110	94.0	94.0	0.0	±1.1
100	94.0	94.0	0.0	±1.1
90	94.0	94.0	0.0	±1.1

Level linearity on each level range

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
130	42.8	42.9	0.1	±1.1
120	32.5	32.6	0.1	±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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T. Petcha-

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	133.1	-0.3	±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	132.2	-0.2	±2.0

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	Negative one-half cycle	-0.1	±1.5
89.4	89.3		

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T. Petcha-

Cert. No. : ACL24115
Job No. : VC67AC0072
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

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ANALYTICAL BALANCE (DU)

Model : XS205DU

Serial No. : 1126323724



Certificate No. : 23-148799
Sample Code : 23-56200-001

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by : Mr. Somwang Sangdee
Scientist
Approved by : (Mr. Somchai Neampunt)
Signed for Director

Issue date : 25 December 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 23-148799
Sample Code : 23-56200-001

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE
Manufacturer : METTLER TOLEDO
Model : XS205DU
Capacity : Max 81 g / 220 g
Resolution : 0.01 mg / 0.1 mg
Serial No. : 1126323724
ID No. : LABE 05/1

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 80	Before adjustment	After adjustment
<input type="checkbox"/> No adjustment	Nominal value	40 80 40 80	
<input checked="" type="checkbox"/> Adjustment	Standard weight	40.000054 80.000048 40.000054 80.000048	
	Average reading of indicator	40.00026 80.00037 40.00017 80.00017	
	Standard deviation	0.000015 0.000016 0.000008 0.000009	

Unit : g	Range : 200	Before adjustment	After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100 200	
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042 200.000041	
	Average reading of indicator	100.00003 200.00004 100.00001 200.00001	
	Standard deviation	0.000005 0.000005 0.000003 0.000005	





Certificate No. : 23-148799

Sample Code : 23-56200-001

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Range : 80		Range : 200	
Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	1.00748	0	1.0274
40	0.98753	100	0.9975
80	0.99751	200	0.9975

3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.0000000	0.00000	0.00000	0.000012	2.05
0.01	0.0100025	0.01000	0.00000	0.000012	2.05
0.1	0.1000019	0.10001	-0.00001	0.000013	2.03
1	1.0000125	1.00001	0.00000	0.000015	2.02
5	5.0000208	5.00004	-0.00002	0.000021	2.00
10	10.0000004	10.00008	-0.00008	0.000026	2.00
20	20.0000030	20.00011	-0.00008	0.000036	2.00
50	50.000014	50.00014	-0.00013	0.000088	2.00
100	100.000042	100.0001	-0.0001	0.00016	2.00
150	150.000056	150.0001	0.0000	0.00022	2.00
200	200.000041	200.0002	-0.0002	0.00027	2.00

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

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Certificate No. : 23-148799

Sample Code : 23-56200-001

REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

Deviation of the measurement value through off-center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Weighing pan		Test weight : 50 and 100	
		Unit : g	
		Range	
		Position	
		Reading of indicator	
		100.0001	
		100.0001	
		100.0001	
		100.0000	
		100.0002	
		100.0001	
		0.00013	

Condition of Calibration

1. Calibration Method : W1-CL-004 base on UKAS LAB 14: 2019

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

place of calibration only.

3. Condition of Calibration tem: Normal

4. This certification is traceable to the International System of Unit maintained at :

Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public

Company Limited (instrument number 1).

5. Reference standard instrument :

Instrument

1) STANDARD WEIGHT 1 kg to 1 kg

Certificate No.

23-105642

Due Date

10 September 2024

End of Report

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ANALYTICAL BALANCE

Model : SECURA224-1S

Serial No. : 0036707137



Certificate No. : 23-148800

Sample Code : 23-56200-002

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Sriacha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : SARTORIUS

Model : SECURA224-1S

Serial No. : 0036707137

ID No. : LABE 05/2

Date of Receipt : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by Mr. Somwang Sangdee
Scientist

Issue date : 25 December 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 23-148800

Sample Code : 23-56200-002

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE
Manufacturer : SARTORIUS
Model : SECURA224-1S
Capacity : Max 220 g
Resolution : 0.0001 g
Serial No. : 0036707137
ID No. : LABE 05/2

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 220	Before adjustment	After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100	200
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042	200.000041
	Average reading of indicator	99.9998 199.9998	200.0000
	Standard deviation	0.00006 0.00007	0.00003

Unit :	Range :	Before adjustment	After adjustment
<input type="checkbox"/> No adjustment	Nominal value	*	*
<input type="checkbox"/> Adjustment	Standard weight	*	*
	Average reading of indicator	*	*
	Standard deviation	*	*

COPY

Certificate No. : 23-148800

Sample Code : 23-56200-002

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Range : 220

Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	0.7980	-	-
100	0.8978	-	-
200	0.8978	-	-

3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.0000000	0.0000	0.0000	0.000086	2.00
0.01	0.0100025	0.0100	0.0000	0.000086	2.00
0.1	0.1000019	0.1000	0.0000	0.000087	2.00
1	1.0000125	1.0000	0.0000	0.000087	2.00
2	2.0000089	2.0000	0.0000	0.000087	2.00
5	5.0000208	5.0001	-0.0001	0.000088	2.00
10	10.000004	10.0000	0.0000	0.000090	2.00
20	20.000030	20.0000	0.0000	0.000093	2.00
50	50.000014	50.0000	0.0000	0.00011	2.00
100	100.000042	100.0000	0.0000	0.00016	2.00
200	200.000041	200.0000	0.0000	0.00028	2.00

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

COPY

Certificate No. : 23-148800

Sample Code : 23-56200-002

REPORT OF CALIBRATION

Result of Calibration :

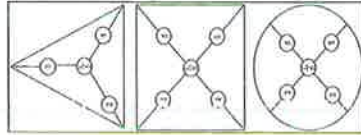
4. Eccentric or off-centre loading

Deviation of the measurement value through off - center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Range	Position	Reading of Indicator	Reading of Indicator
1	100.0000	-	-
2	100.0000	-	-
3	100.0000	-	-
4	99.9999	-	-
5	100.0000	-	-
6	100.0000	-	-
Maximum difference	0.0001	-	-

● Circle
○ Triangular
○ Rectangular

Test weight : 100
Unit : g



Condition of Calibration

- Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019
- This result of calibration was found accurate as shown on date and place of calibration only.
- Condition of Calibration item: Norma
- This certification is traceable to the International System of Unit maintained at : *

Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public

Company Limited (Instrument number 1)

5. Reference standard instrument :

Instrument

1) STANDARD WEIGHT 1 mg to 1 kg

Class ID No.

E2 LB-WF-79

Certificate No.

23-105642

Due Date

10 September 2024

End of Report -

COPY

BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD
214 Bangwaek Rd. Bangnai Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Customer

: Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Certificate No. : L202405022-0013
Date Issued : 08-May-24

Equipment

: Analog Barometer

Manufacturer

: Barigo

Model

: -

Serial No.

: -

ID No./Tag No.

: BM001/41

Date Received

: 03-May-24

Date Calibrated

: 06-May-24

Calibrated by

: Mr. Saruth Srichulikul

Calibration Method or Calibration Procedure Used

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

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

Result of Calibration

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

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

Approved by:

Sarayuth T.
(Mr. Sarayuth Tochua)

Page 1 of 2



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Certificate No : L202405022-0013

Environment Ambient Temperature : (25 ± 2)°C

Relative Humidity : (50 ± 15)%RH

STD Reading mbar	UUC Reading (mbar) Before Adjusted	UUC Reading (mbar) After Adjusted	UUC Error mbar	Uncertainty ± mbar	MPE ± mbar	Pass with Gua
990.00	990	-	0.00	0.59	10.3	Pa
1000.00	1000	-	0.00	0.59	10.3	Pa
1010.00	1010	-	0.00	0.59	10.3	Pa
1020.00	1020	-	0.00	0.59	10.3	Pa
1030.00	1030	-	0.00	0.59	10.3	Pa

STD = Standard Pass = $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$

UUC = Unit Under Calibration Fail = $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

MPE = Maximum Permissible Error

Calibrated condition :

Pressure Medium

Mounting Position

Reference Level

Conversion Factor

Air : Density = 1.19 kg/m³ @ 20°C. 1 bar

Vertical

at center of its dial

Multiply by 1.0 E+02 - Pa unit

Description of UUC :

Range

950 - 1080 mbar Absolute

Calibration Range

990 - 1030 mbar Absolute

Scale Interval

1 mbar

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

IRPC Certificate No. CL1-P230097 for Reference Pressure Monitor Serial No. 1598, Due 09-Nov-24

End of Certificate

COPY

BOD INCUBATOR

Model : LABE 19/3



CERTIFICATE OF CALIBRATION

Page 1 of 3

Certificate No. : 24-089291
Sample Code : 24-35676-001

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhaphibarn 8 Rd., Nongkham, Sriracha,

Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.

(Laboratory)

Equipment : Temperature controlled enclosures (Incubator)

Manufacturer : บริษัท เจริญชัย : N/A

Serial No. : S43020027 : LABE 19/3

Date of Receipt : 16 July 2024 : Date of Calibration : 16 July 2024

Condition of Calibration

1. Environment 1.1 Ambient temperature : Maximum 30.6 °C ; Minimum 28.9 °C
1.2 Relative humidity : Maximum 76.9 % ; Minimum 69.4 %
1.3 Line voltage supplied : Maximum 219.8 VAC ; Minimum 217.1 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data acquisition with sensor (RTD-P100)	LB-DA-12 (RTD-168 to RTD-176)	24-046389	28 April 2025

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by

Mr. Pattanapong Pulngern

Approved by

(Mr. Somchai Neampunt)

Scientist

Signed for Director

Issue date

17 July 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 capability to recognize 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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Effective Date: 15/10/21



REPORT OF CALIBRATION

Page 2 of 3

Certificate No. : 24-089291
Sample Code : 24-35676-001

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)/reading (°C)	Measured temperature at each positions (°C)										Uncertainty ± (°C)	Coverage factor k
		# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 ^{1/4}	# 10		
20	20.0	20.56	20.45	20.01	19.85	20.21	20.25	20.17	20.05	20.11	20.11	0.24	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
20	0.08	0.50	0.87

Notes

UUC* = Unit Under Calibration

Signature

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WWW.AMARC.CO.TH

Effective Date: 15/10/21



REPORT OF CALIBRATION

Certificate No. : 24-089291

Sample Code : 24-35676-001

Results of Calibration**Notes**

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 70 cm ; D = 55 cm ; H = 140 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

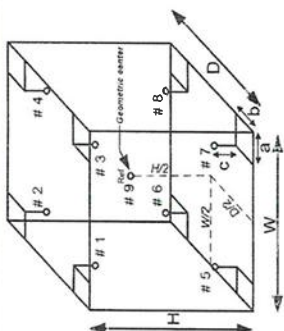


Figure: Example of sensor
Installation Positions

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor k , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3000.

- End of Report -

GOPY

BOD INCUBATOR

Model : LABE 19/5



CERTIFICATE OF CALIBRATION

Page 1 of 3
Certificate No. : 24-046203
Sample Code : 24-18906-002

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Laboratory)

Equipment : Temperature controlled enclosures (Incubator)

Manufacturer : Lovibond

Model : Tc445S

Serial No. : 0520/005227

ID No. : LABE 19/5

Date of Receipt : 18 April 2024

Date of Calibration : 18 April 2024

Condition of Calibration

1. Environment

1.1 Ambient temperature	: Maximum	35.0 °C	: Minimum	33.7 °C
1.2 Relative humidity	: Maximum	69.1 %	: Minimum	50.0 %
1.3 Line voltage supplied	: Maximum	222.5 VAC	: Minimum	218.8 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-P100)	LB-DA-08 (RTD-248 to RTD-256)	23-084070	05 August 2024

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by Mr. Sarawoot Thammo Approved by (Mr. Nuttaput Timula)

Scientist

19 April 2024

Issue date

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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REPORT OF CALIBRATION

Page 2 of 3
Certificate No. : 24-046203
Sample Code : 24-18906-002

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k	
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8			# 9 th
20	20.5	20.0	20.28	19.86	19.90	19.91	19.82	20.10	20.01	19.89	19.75	0.59	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
20	0.45	0.85	1.31

Notes

* UUC* = Unit Under Calibration

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(Effective Date: 15/10/21)



REPORT OF CALIBRATION

Page 3 of 3

Certificate No. : 24-O46203

Sample Code : 24-18906-002

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 60 cm ; D = 56 cm ; H = 146 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

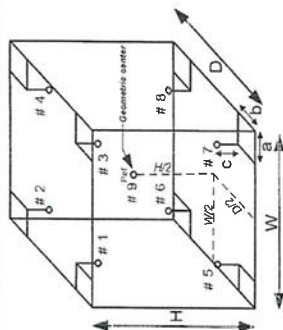


Figure: Example of sensor
Installation Positions

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

End of Report -

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CONDUCTIVITY METER

Type : SevenCompactTM Conductivity meter S230

Serial No. : B744909989

Certificate Number CCP-2403-24

Certificate Number CCP-2403-24

Calibration Certificate
SevenCompact™ Conductivity Meter S230

Customer

Company EASTERN THAI CONSULTING 1992 CO., LTD.
Address 683 Moo 11, Sukhaphiban 8 Rd., Nong Kham, Sriracha
Chonburi 20230
Customer ID number 301608441
Customer representative Sasiporn Nakin

Certified conductivity
resistors

Manufacturer METTLER TOLEDO
Type 51302861

Serial number S430
Certificate number 71451
Date of certification September 26, 2023

Instrument

Type SevenCompact™ S230 Instrument serial number B74490989
Internal Identification LABE 13/2 Firmware version 2.01.03

Certified temperature
resistors

Manufacturer METTLER-TOLEDO
Type 51302410

Serial number A425
Certificate number 71447
Date of certification September 26, 2023

Technical Specifications

Measuring range 0.001 µS/cm ... 1000 mS/cm
Resolution Auto range
Limit of error ±0.5%

Temperature range MTC -30.0 ... 130.0 °C
Temperature range ATC -5.0 ... 130.0 °C
Resolution 0.1 °C
Limit of error ±0.1 °C

Designation	Nominal value	Certified value
NTC 30 kΩ, 0 °C	94.980 kΩ	94.941 kΩ
NTC 30 kΩ, 25 °C	30.000 kΩ	29.992 kΩ
NTC 30 kΩ, 50 °C	10.969 kΩ	10.975 kΩ
NTC 30 kΩ, 75 °C	4.528 kΩ	4.528 kΩ
NTC 30 kΩ, 100 °C	2.070 kΩ	2.069 kΩ

Designation	Nominal value	Certified value
Conductivity 10 Ω	10.000 Ω	10.002 Ω
Conductivity 150 Ω	150.00 Ω	150.02 Ω
Conductivity 1.5 kΩ	1.5000 kΩ	1.5004 kΩ
Conductivity 15 kΩ	15.000 kΩ	14.998 kΩ
Conductivity 150 kΩ	150.00 kΩ	149.95 kΩ
Conductivity 1 MΩ	1.0000 MΩ	0.9999 MΩ

Procedure Statement

METTLER TOLEDO Certification SOP (Doc. No. 30027577) is used as referring documentation to adjust and certify the instrument indicated in the "Type" and "Serial number" section. The measurement results of this certification were obtained at ambient conditions.

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Certificate Number CCP-2403-24

Certification Measurements

Designation	Certified value	Measured value	Max. tolerance	Passed / Failed
Conductivity sensor input (resistance)				
10 Ω	10.002 Ω	10.000 Ω	0.5 %	Passed
150 Ω	150.015 Ω	150.000 Ω	0.5 %	Passed
1.5 kΩ	1.500 kΩ	1500.00 Ω	0.5 %	Passed
15 kΩ	14.998 kΩ	15000 Ω	0.5 %	Passed
150 kΩ	149.950 kΩ	149900 Ω	0.5 %	Passed
1 MΩ	1.000 MΩ	999700 Ω	0.5 %	Passed

Conductivity sensor input (temperature)

Designation	Nominal value	Measured value	Max. tolerance	Passed / Failed
NTC 30 kΩ, 0 °C	0.0 °C	0.0 °C	0.1 °C	Passed
NTC 30 kΩ, 25 °C	25.0 °C	25.0 °C	0.1 °C	Passed
NTC 30 kΩ, 50 °C	50.0 °C	50.0 °C	0.1 °C	Passed
NTC 30 kΩ, 75 °C	75.0 °C	75.0 °C	0.1 °C	Passed
NTC 30 kΩ, 100 °C	100.0 °C	100.0 °C	0.1 °C	Passed

Verification according to USP <645> cell constant = 0.100 /cm

Resistor designation	Certified value	Measured value	Max. tolerance	Passed / Failed
1 MΩ	0.100 μS/cm	0.100 μS/cm	0.1 μS/cm	Passed
150 kΩ	0.667 μS/cm	0.667 μS/cm	0.1 μS/cm	Passed
15 kΩ	6.667 μS/cm	6.667 μS/cm	0.1 μS/cm	Passed

Digital sensor input with conductivity sensor

Sensor recognition	The sensor was recognized correctly by the meter	Passed
--------------------	--	--------

Summary of Certification

Certification of instrument

Passed

The instrument referred to in this certificate has fulfilled the criteria of the certification. This is indicated by the notation Passed above.

Remarks

Service Assignment ID : 0332980040-001

Certification of the instrument was performed by

Name	Thiraphong Salanoi	Function	Service Engineer
Company	Mettler-Toledo (Thailand) Ltd.	Signature	
Date	February 5, 2024		

Mettler-Toledo (Thailand) Limited

METTLER TOLEDO

Performance Test

Attachment to Certificate No. CCP-2403-24

Conductivity Sensor

Type:	InLab 731	S/N:	5822433675
-------	-----------	------	------------

Certified standards used

Standard 1:	Type:	Cond. Standard	Manufacturer: METTLER TOLEDO	Exp. date: 30/Nov/2024
		Nominal value: (25.00 °C):	1413 uS/cm	Lot No.: 1H334C

Standard 2:	Type:	Cond. Standard	Manufacturer: METTLER TOLEDO	Exp. date: 24/Feb/2024
		Nominal value: (25.00 °C):	12.88 mS/cm	Lot No.: 1H055A

Cell Constant Adjustment

Nominal	Nominal Cell Constant	As Found (cm ⁻¹)	As Left (cm ⁻¹)
1413 uS/cm	0.570000	0.541477	0.544712

Note: The cell constant should be within +/- 20% of nominal cell constant.

Measurements (Temperature correction is 0.00 % / °C or Off)

As Found				As Left									
Cond. Standard Values		Measured	Difference	Cond. Standard Values		Measured	Difference						
1444	uS/cm	26.1	°C	1462	18	1.2%	1449	uS/cm	26.3	°C	1450	1	0.1%
13.20	mS/cm	26.3	°C	13.05	-0.15	1.1%	13.13	mS/cm	26.0	°C	13.02	-0.11	0.8%

Note: The difference result of calibrated electrode should be within +/- 2.0%

Remarks:

Place:	Laboratory Room	Performance Date:	15/Feb/2024
Service Specialist:	Thiraphong Salanoi	Signature:	

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Hot Air Oven

Model : UM 400

Serial No. : 900982

NSC-TSI-TS17025
CALIBRATION 0152

Page 1 of 3

CERTIFICATE OF CALIBRATION

Certificate No. : 24-001944
Sample Code : 24-00963-001Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Sriracha, Chonburi 20230Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Hot Lab)Equipment : Temperature controlled enclosures (Hot air oven)
Manufacturer : Memmert
Model : UM 400
Serial No. : 900982
ID No. : LABE 17/1
Date of Receipt : 09 January 2024
Date of Calibration : 09 January 2024

Condition of Calibration

1. Environment
1.1 Ambient temperature : Maximum 30.6 °C ; Minimum 29.2 °C
1.2 Relative humidity : Maximum 57.5 % ; Minimum 46.4 %
1.3 Line voltage supplied : Maximum 229.5 VAC ; Minimum 222.5 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-Pt100)	LB-DA-10 (RTD-257 to RTD-265)	23-066256	29 June 2024

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by

Mr. Sarawoot Thammo
Scientist

Approved by

(Mr. Somchai Neampunt)
Signed for Director

Issue date

09 January 2024

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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CALIBRATION 0152

Page 2 of 3

REPORT OF CALIBRATION

Certificate No. : 24-001944
Sample Code : 24-00963-001

Results of Calibration

Resolution : 0.1 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C)	UUC* reading (°C)	Measured temperature at each positions (°C)								Uncertainty ± (°C)	Coverage factor k
			# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 ^{Rev}	
60	60.0	60.0	60.04	59.90	59.81	59.84	59.47	59.91	60.08	59.98	59.87	2.00
85	85.0	85.0	86.07	85.75	85.58	85.62	84.69	85.83	86.28	85.94	85.77	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
60	0.11	0.49	0.80
85	0.09	1.13	1.72

Notes

* UUC* = Unit Under Calibration

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Effective Date: 15/10/21

NSC-TISI-TIS17025
CALIBRATION 0152

REPORT OF CALIBRATION

Page 3 of 3

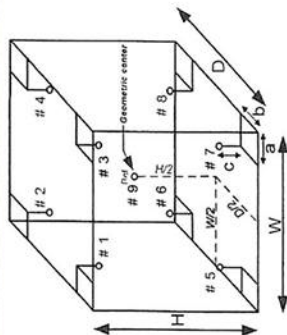
Certificate No. : 24-001944

Sample Code : 24-00963-001

Results of Calibration

Notes

1. Sensor installation locations
 - 1.1 All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - 1.2 The reference sensor is preferably located of the geometric center of the chamber.
2. Interior dimensions approx of chamber :
W = 40 cm ; D = 28 cm ; H = 39 cm
3. Air valve or fresh air level : Off
4. Fan level : Open
5. The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
6. 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.
7. Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
8. Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
9. UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
10. Calibration results without adjustment.

Figure: Example of sensor
installation Positions

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -


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ICP-OES/Avio550

Serial No. : M81S2210101

ICP-OES/Avio550 Preventive Maintenance (PM)

Company Name:		Eastern Thai Consulting 1992 Cl.,Ltd.	
Address (Instrument Location):		683 Moo 11 Sukapibal 8 Rd. Nong Kham, Si Racha, Chonburi 20230	
Serial Number:	M8152210101	PM Number:	2 of 2
Customer Name (if applicable):		Telephone Number:	
Service Engineer Name:	Khwanchai	Service Order Number:	WO-02963150
Date PM Performed: (DD-MMM-YYYY)	25-Oct-2024	Next PM Due Date: (DD-MMM-YYYY)	25-Apr-2025
Standard Labor Hours to Complete PM :		4 hours	

Part Number	Release	Publication Date	 PerkinElmer®
TH09370188 Rev.2	B	July 2020	

Scope

The purpose of this PM is to ensure the continued functionality of the PerkinElmer / Avio550 by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer. The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files. The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer. Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes
NA	NA	NA

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
09995098	Air Filter-Spectrometer	N/A
N077520	Air Filter-RF Generator	N/A
09992731	Axial Window	N/A
B0810377	Radial Window	N/A
N0770438	O-ring kit, injector support adapter	N/A
N0780437	O-ring kit, torch	N/A

Additional Reagents and Standards Required for PM			
Part Number (if applicable)	Description	Quality	Batch/Lot #
N0691579	Multi-Element Standard	AR	61-176CRX1
N9300221	DL Standard diluted 100 X	AR	59-091CRY1
N0582152	Wave Cal Solution	AR	61-023CRX1
N9302946	VIS Wavecal Solution	AR	58-145CRT1
			06/2025
			11/2024
			02/2025
			04/2025

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Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Ask customer about unit's performance since last visit.
- ☒ Check incoming AC line voltage under load for proper levels and grounding.
- ☒ Is the instrument operational? If not, please comment.

2. Mechanical:

- ☒ Inspect and clean all fans and filters.
- ☒ Inspect and replace torch components and necessary.
 - Torch Components Replaced: ☐ Yes ☒ No
 - Tubing Replaced: ☐ Yes ☒ No
- ☐ Inspect all tubing for signs of cracking or leaking and replace as necessary.
- ☒ Inspect the peristaltic pump for proper operation.
- ☒ Check and adjust if necessary, the external nitrogen, argon shear gas and water supply pressures.
- ☒ Check and adjust if necessary, the internal nitrogen, main argon, torch argon and shear gas pressures.

Regulator	Measured Pressure	Set Pressure
Nitrogen	NA	NA (calibrated in factory)
Main Argon	76	76 psig
Torch Argon	67	67 psig
Shear Gas	65	65 psig
Water	35	35 psig

- ☒ Check shear gas nozzle for blockages and proper, uniform flow.
- ☒ Inspect nitrogen Hi/Low purge and shear gas solenoids for proper function.
- ☒ Inspect the function of all spectrometer motors. Drive the motors from the Spectrometer DCM. (slits, XY motor)
- ☒ Inspect the function of the pneumatic shutter for proper operation.
- ☒ Perform preventative maintenance on the chiller as required. Make the customer aware of the importance of maintaining the chiller fluid level and filter replacement.
- ☒ Drain air compressor surge tank.
- ☒ Clean exterior of instrument.
- ☒ Visually inspect all PC boards for cleanliness and signs of corrosion.

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3. Electrical

- ☒ Check all RF generator and spectrometer power supply voltages.
- ☒ Run instrument diagnostic checks from the appropriate Device Control Module.

RF Generator:

- ☒ Check the RF generator status screens.
- ☒ Check the function of all interlocks.

Spectrometer:

- ☒ Check the spectrometer status screens. Ensure Ready mode with no fetal errors.
- ☒ Check the spectrometer optical tub temperatures (top, bottom, fin, optical base).
- ☒ Check detector temperatures.
- ☒ Check TEC voltages (6.5VDC)

4. Optical:

- ☒ Clean or replace the axial and radial view windows as necessary.
 - Axial Window Replaced: ☐ Yes ☒ No
 - Radial Window Replaced: ☐ Yes ☒ No

5. PM Performance Tests:

- ☒ Perform View Align.

Test Spectral Resolution:

- ☒ Measure the spectrometers ability to separate two adjacent wavelengths.

Parameter	Specification	Test Result	Pass/Fail
As 193.696 - Resolution	≤0.007	0.00528	Passed
Ni 231.604 - Resolution	≤0.008	0.00724	Passed
Ni 341.476 - Resolution	≤0.012	0.00911	Passed
La 408.572 - Resolution	≤0.020	0.01596	Passed
Ba 455.403 - Resolution	≤0.025	0.02165	Passed

Test Precision:

- ☒ Test for reproducibility of a set of measurement.

Parameter	Specification	Test Result	Pass/Fail
As 193.696	%RSD ≤ 1 %	0.26	Passed
Zn 213.856	%RSD ≤ 1 %	0.21	Passed
Mn 257.610	%RSD ≤ 1 %	0.20	Passed
La 379.478	%RSD ≤ 1 %	0.21	Passed
Ba 455.403	%RSD ≤ 1 %	0.21	Passed
Ba 493.408	%RSD ≤ 1 %	0.19	Passed

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☒ Run an Axial & Radial BEC according to the A&T spec.

Test Axial BEC Cd:

Method "BEC-XL" For Samples "IB (2% HNO_3)" and "IS (N930-0221/100)", record intensities.

Calculated BEC: $\text{BEC} = (\text{IB} * \text{Conc of Std}) / (\text{IS} - \text{IB})$. Where Conc of Std = 500 PPB

Element	Conc	IB	IS
Cd 226	500	523.1	223029.5
IB*Conc	IS-IB	BEC	Spec
261550	222506.4	1.18	<150 PPB
			Passed

Test Radial BEC Mn:

Method "BEC-RL" For Samples "IB (2% HNO_3)" and "IS (N069-1579)", record intensities.

Calculated BEC: $\text{BEC} = (\text{IB} * \text{Conc of Std}) / (\text{IS} - \text{IB})$. Where Conc of Std = 1,000 PPB

Element	Conc	IB	IS
Mn 257	1,000	586.9	253416.6
IB*Conc	IS-IB	BEC	Spec
586900	252829.7	2.32	<45 PPB
			Passed

6. Review:

- ☒ Review with the customer PM work performed.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM
None

Review

The preventive maintenance checks and if applicable performance tests for ICP-OES/Avio550 have been completed.	
This ICP-OES/Avio550 Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative:	Date: 25-Oct-2024 (DD-MMM-YYYY)
Authorized Customer Representative:	Date: 25-Oct-2024 (DD-MMM-YYYY)

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LIQUID IN GLASS THERMOMETER

Model / Type : 0-100 °C

Serial No. : 43560



CALIBRATION LABORATORY CO., LTD.
210-11,14,55 Soi Prasert Manukit 29 Yaek 4, Prasert Manukit Rd., Ladphrao, Bangkok 10230
Tel. 02-578-0253-4 Fax: 02-578-2672 www.cali-laboratory.com E-mail: sale@cali-laboratory.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : LIQUID IN GLASS THERMOMETER
MANUFACTURER : AA PRECISION
MODEL / TYPE : 0-100 °C
SERIAL NO. : 43560[LABE 16/1]
CLID. NO. : 232403905
JOB CONTROL NO. : 241031116258
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : EASTERN THAI CONSULTING 1992 CO., LTD.
683 MOO 11, SUKHAPIBARN 8 RD,
NONGKHAM, SRIRACHA, CHONBURI 20230

DATE OF RECEIVED : 31 October 2024 DATE OF ISSUED : 05 November 2024

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

Calibrated By : Pimsiri Hemtanon
Calibration Engineer



Approved By : Mongkol Yotsoontorn
Authorized Signatory
05 November 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. Q24116258
F3-011-05/12-23



page 1 of 3



edcalibration



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Tel. 02-578-0253-4 Fax: 02-578-2672 www.cali-laboratory.com E-mail: sale@cali-laboratory.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE : LIQUID IN GLASS THERMOMETER
MANUFACTURER : AA PRECISION
MODEL / TYPE : 0-100 °C
SERIAL NO. : 43560[LABE 16/1]
DATE OF CALIBRATION : 04 November 2024

ENVIRONMENT CONDITIONS :

Temperature : $(23 \pm 2) ^\circ\text{C}$ Relative Humidity : $(55 \pm 10) \% \text{ RH}$

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPTH-02 based on ASTM E 77-07 as calibration guidelines.
The calibration was performed by comparison with Calibration Bath, Precision Thermometer and IPT
which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

1. Calibration Bath, Kumbic Model OB-22/2 ULT, OB-22/2 S/N. 17115653, 17115654.
2. Precision Thermometer, ASL Model F200-A-8 S/N. 014433/03 with IPT S/N. L0193A-1-1, PO106346-1-18.

TRACEABILITY :

1. The measurements are traceable to International System of Units (SI), through Calibration Laboratory Co., Ltd. Certificate No. Q23136342, Q23126517. Due Date 20 December 2024, 20 November 2024.
2. The measurements are traceable to International System of Units (SI), through Thailand Institute of Scientific and Technological Research (TISTR) and National Institute of Metrology (Thailand). Certificate No. PSL-T 0203/67, TT-0136-23, TT-0110-24. Due Date 07 December 2024, 12 December 2024, 06 August 2025.

UNCERTAINTY :

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

Certificate No. Q24116258
F3-011-05/12-23



page 2 of 3



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ANAB
ASQ Business Accreditation and Training
A C C R E D I T E D
CALIBRATION
FACILITY
UNIVERSITY OF ALABAMA
ACCOMPLISHMENT
/CLM 2814

CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION

MEASUREMENT RESULTS : (X) without adjustment () adjustment

The DUC Reading were recorded and the means value were reported of four times measurement in the table below.

CALIBRATION DATA

CORRECTION OF TEMPERATURE

STD Reading (°C)	DUC Reading (°C)	Correction (°C)	Uncertainty ± (°C)
0.039	0.00	+0.039	0.065
25.003	25.00	+0.003	
50.008	50.00	+0.008	
100.013	100.00	+0.013	

Range : 0 °C to 100 °C

Graduation : 0.1 °C

Immersion Type : Total Immersion.

Correction of Reference Temperature (0 °C) = 0.039 °C

Note: The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 56 of 67

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

End of Certificate

Certificate No. Q24116258

F3-011-05/12-23

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page 3 of 3



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pH Meter

Model : SevenCompact S220

Serial No. : B448305208

NSC-TIS-1517025
CALIBRATION0152

CERTIFICATE OF CALIBRATION

Page 1 of 3

Supersedes to Calibration Certificate No. 24-001949

Certificate No. : 24-001949/1

Sample Code : 24-00963-006

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Laboratory)

Equipment : pH Meter
Manufacturer : METTLER TOLEDO
Serial No. : B448305208
Model : SevenCompact S220
ID No. : LABE 11/4
Date of Receipt : 09 January 2024
Date of Calibration : 09 January 2024

Condition of Calibration

1. Environment
1.1 Ambient temperature : 22.4 ± 0.2 °C 1.2 Relative humidity : 56.4 % ± 2.1 %

2. Calibration method
In house method WI-CL-019; based on direct measurement by using standard voltage calibrator and using certified reference material (CRM).

3. Reference standard / Certified reference material

Instrument	ID No.	Certificate No.	Due Date
3.1 Voltage Calibrator	LB-AMC-01	23E3244	03 October 2024
3.2 Digital Thermometer	LB-TH-33	23-098974	25 August 2024
Certified Reference Material		Lot No.	Expire Date
3.3 Buffer Solution pH 4.008	919273	PH216.L5	24 September 2025
3.4 Buffer Solution pH 6.886	941727	PH107.L5	06 November 2024
3.5 Buffer Solution pH 9.997	919278	PH220.L5	24 September 2024

4. This certificate is traceable to the international system of unit (SI Unit).

- 4.1 Instrument No. 3.1 through Technology Promotion Association (Thailand-Japan).
4.2 Instrument No. 3.2 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.
4.3 Buffer Solution No. 3.3 and No. 3.5 traceable to CPA chem (through primary measurement method-Harned cell using calibrated thermometer, barometer, and nanovoltmeter Accredited laboratory ISO/IEC 17025 and ISO/IEC 17034).
4.4 Buffer Solution No. 3.4 traceable to CPA chem (CPA ReIN HARNED CELL LoIN 61275737; CPA ReIN HARNED CELL LoIN 61273986 Accredited laboratory ISO/IEC 17025 and ISO/IEC 17034).

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

6. Condition of calibration item : Normal

Calibrated by Mr. Nuttaput Timula
Scientist

Approved by

(Mr. Somchai Neampunt)

Issue date 31 January 2024

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

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

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 this 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

NSC-TIS-1517025
CALIBRATION0152

REPORT OF CALIBRATION

Page 2 of 3

Supersedes to Calibration Certificate No. 24-001949

Certificate No. : 24-001949/1

Sample Code : 24-00963-006

Equipment : pH Meter
Manufacturer : METTLER TOLEDO
Serial No. : B448305208
Model : SevenCompact S220
ID No. : LABE 11/4
Range : -2,000 pH to 20,000 pH ; ±2000.0 mV ; -5.0°C to 130.0°C

Results of Calibration

Part 1. DC Voltage measurement
pH Meter Serial No. : B448305208

Nominal Value	Applied DC Voltage mV	Average indicator reading		Uncertainty mV	Coverage factor k
		mV	pH		
0	414.113	413.9	0.00	± 0.083	2.00
4	177.477	177.4	4.00	± 0.083	2.00
7	0.000	0.1	7.00	± 0.083	2.00
10	-177.477	-177.3	10.00	± 0.083	2.00
14	-414.113	-413.8	14.00	± 0.083	2.00

Part 2. Performance of Electrode system

Electrode Manufacturer : METTLER TOLEDO Model : InLab Expert Pro-ISM

Electrode Serial No. : 2453982

Three-Point Calibration at pH4, pH7 and pH10 Percent Slope : 98.3

Standard Buffer Solution pH (@ 25 °C)	Average indicator reading		Error Value pH	Uncertainty pH	Coverage factor k
	pH	mV			
4.008	4.01	182.1	0.002	± 0.010	2.00
6.886	7.00	7.8	0.014	± 0.011	2.00
9.997	10.01	-167.2	0.013	± 0.011	2.00

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

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REPORT OF CALIBRATION

Page 3 of 3

Supersede to Calibration Certificate No. 24-001949

Certificate No. : 24-001949/1

Sample Code : 24-00963-006

Equipment : pH Meter (Digital Thermometer with sensor)

Thermometer readout

Manufacturer : METTLER TOLEDO Model : SevenCompact S220

Serial No. : B44B305208 ID No. : LABE 11/4

Resolution : 0.1 °C Range : -5.0 °C to 130.0 °C

Thermometer sensor

Manufacturer : METTLER TOLEDO Model : InLab Expert Pro-ISM

Serial No. : 2453982 ID No. : N/A

Condition of Calibration

1. Environment 1.1 Ambient temperature : 22.6 °C ± 0.1 °C

1.2 Relative humidity : 55.1 % ± 3.3 %

2. Calibration method

2.1 The calibration use in house method WI-CL-021 : by comparison with standard thermometer

2.2 The calibration by comparison unit under calibration (UUC) to the standard thermometer in a calibration bath at the controlled temperature.

2.3 The temperature scale in use of this laboratory is the international temperature scale of 1990 (ITS-90).

3. Reference standard instrument

Instrument	Model	ID. No.	Certificate No.	Due date
3.1 Resistance Thermometer	PT-100	RTD-90	23-098974	25 August 2024
3.2 Thermometer Readout	GT-11	LB-TH-33	23-098974	25 August 2024

4. This certificate is traceable to the international system of unit (SI Unit).

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (Accreditation Under TLAS Laboratory Calibration No.0152)

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

6. Condition of Calibration item : Normal

Results of Calibration

Calibration point °C	Average of standard reading °C	Unit under calibration		Expanded uncertainty °C	Coverage factor k
		Immersion depth mm	Average reading °C		
25	25.000	120	25.0	± 0.14	2.00

Notes

- Calibration results without adjustment

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M0003

- End of report -

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STANDARD WEIGHT 50 g



Certificate No. : 22-052238
Sample Code : 22-19150-003

Page 1 of 3

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

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FM-CL-007

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Rev.05

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date: 15/10/21



Certificate No. : 22-052238
Sample Code : 22-19150-003

Page 2 of 3

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : METTLER TOLEDO

Class : F1

Serial No. : N/A

ID No. : LABE 10/1

Result of Calibration :

☒ Without adjustment

☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_0) of 1.2 kg.m⁻³

Description	Deviation	Conventional	Expanded	Maximum	ID No.
	(mg)	Mass	Uncertainty	Permissible Error	
			(mg)	± (mg)	
50 g	-0.324	49.999676 g	0.10	0.30	LABE 10/1

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor $k=2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

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361 Soi Ladprao 122, Ladprao Road,

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FM-CL-084

TEL 02-516-2422

FAX 02-516-6949

Rev.03

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date: 15/10/21



Certificate No. : 22-052238

Sample Code : 22-19150-003

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature $20^{\circ}\text{C} \pm 1.5^{\circ}\text{C}$, Relative humidity $50\% \pm 10\%$ and air density 1.20 kg/m^3
2. Calibration Method : Direct comparison weighing according to OIML R111-1 : 2004(E)
3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-078366	22 September 2022

4. This certification is traceable to the International System of Unit maintained at : -

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

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STANDARD WEIGHT 100 g



Certificate No. : 22-052239
Sample Code : 22-19150-004

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiban 8 Rd., Nongkham,
Siriracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 22-052239
Sample Code : 22-19150-004

REPORT OF CALIBRATION

Equipment : Standard Weight 100 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/2

Result of Calibration : ☒ Without adjustment ☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_a) of 1.2 kg.m⁻³

Description	Deviation (mg)	Conventional Mass	Expanded Uncertainty (mg)	Maximum Permissible Error \pm (mg)	ID No.
100 g	-0.171	99.999829 g	0.16	0.50	LABE 10/2

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor $k = 2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

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Certificate No. : 22-052239

Sample Code : 22-19150-004

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m³

2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-78	21-079366	22 September 2022

4. This certification is traceable to the International System of Unit maintained at :-

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated item :

Type and Nominal Value :	Standard Weight 100 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

COPY

STANDARD WEIGHT 50 g

MSC-TS-17517025
CALIBRATION 0152

Page 1 of 3

Certificate No. : 22-052237

Sample Code : 22-19150-002

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
689 Moo 11, Sukhapiban 8 Rd., Nongkham,
Siracha, Chonburi 20230

Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration Laboratory)

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

Date of Receipt : 18 May 2022

Date of Calibration : 30 May 2022

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 31 May 2022

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

MSC-TS-17517025
CALIBRATION 0152

Page 2 of 3

Certificate No. : 22-052237

Sample Code : 22-19150-002

REPORT OF CALIBRATION

Equipment : Standard Weight 50 g

Manufacturer : N/A

Class : N/A

Serial No. : N/A

ID No. : LABE 10/4

Result of Calibration :

☒ Without adjustment☐ Adjustment

Conventional value of the result of weighing in air. For a weight taken at a reference temperature (t_{ref}) of 20°C, the conventional mass is the mass of a reference weight of a density (ρ_{ref}) of 8000 kg.m⁻³ which it balances in air of a reference density (ρ_0) of 1.2 kg.m⁻³

Description	Deviation (mg)	Conventional		Expanded Uncertainty (mg)	Maximum Permissible Error ± (mg)		ID No.
		Mass					
50 g	-0.111	49.999889 g		0.10	0.30		LABE 10/4

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor $k=2.0$, which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

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NSC-TIS-71517025
CALIBRATION 0152

Certificate No. : 22-052237

Sample Code : 22-19150-002

Page 3 of 3

REPORT OF CALIBRATION

Condition of Calibration

1. Ambient Conditions : Temperature 20 °C ± 1.5°C, Relative humidity 50% ± 10% and air density 1.18 kg/m³
2. Calibration Method : WI-CL-007 base on OIML R 111-1 : 2004(E)

3. Reference standard instrument

Instrument	Class	ID No.	Certificate No.	Due Date
1) Standard Weight 1 mg to 1 kg	E2	LB-WE-79	21-079366	22 September 2022

4. This certification is traceable to the International System of Unit maintained at :-

Asia Medical and Agricultural Laboratory and Research Center Public Company Limited

(Instrument number 1).

5. Condition of Calibration item: Normal

6. Description of Calibrated Item :

Type and Nominal Value :	Standard Weight 50 g
Shape :	Cylindrical weight with knob
Material :	Stainless steel
Case :	Wooden Box
Comments :	Recalibration

- End of Report -

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THERMO-HYGROMETER

Model : 608-H1

Serial No. : 45106737



CERTIFICATE OF CALIBRATION

Page 1 of 2

Certificate No. : 24-062442
Sample Code : 24-25546-002

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapibarn 8 Rd., Nongkham,
Sriracha, Chonburi 20230Location of Calibration : Asia Medical and Agricultural Laboratory and Research Center Public Company Limited
(Calibration laboratory)

Equipment : Digital thermo-hygrometer

Manufacturer : testo Model : 608-H1

Serial No. : 45106737 ID No. : LABE 09/7

Date of Receipt : 23 May 2024 Date of Calibration : 27-28 May 2024

Condition of Calibration

1. Environment
- 1.1 Ambient temperature : 23.0 °C ± 3.0 °C
- 1.2 Relative humidity : 55.0 % ± 15.0 %

2. Calibration method

- 2.1 In-house method: WI-CL-045 By comparison with thermometer standard / chilled mirror hygrometer in controlled chamber.
- 2.2 The calibration by comparison unit under calibration (UUC) to the thermometer standard / chilled mirror hygrometer in a chamber at the controlled temperature / relative humidity.

3. Reference standard instrument

Instrument	Model	ID No.	Certificate No.	Due Date
3.1 Chilled Mirror	Optidew 401	LB-DP-03 & LB-DP-03 (DP)	TH-0064-23	07 August 2024
3.2 Digital Thermometer	Optidew 401	LB-DP-03 & LB-DP-03 (Temp.)	23-103423	03 September 2024
3.3 Digital Thermometer	34972A	LB-DA-07 with RTD-89	23-101374	05 September 2024

4. This certificate is traceable to the international system of unit (SI Unit).

- 4.1 Instrument No. 3.1 through National Institute of Metrology (Thailand).
- 4.2 Instrument No. 3.2 and 3.3 through Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by

Miss Pornsuda Lohabai

Approved by

(Mr. Sornchai Neampunt)

Scientist

30 May 2024

Issue date

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladprao 122, Ladprao Road,

Phlabphla, Wang Thonglang, Bangkok 10310

FM-CL-114

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FAX 02-516-6949

Rev 01

CONTACT@AMARC.CO.TH

WWW.AMARC.CO.TH

Effective Date 15/07/21



REPORT OF CALIBRATION

Page 2 of 2

Certificate No. : 24-062442
Sample Code : 24-25546-002

Results of Calibration

Temperature measurement

Resolution : 0.1 °C
Range : 0 °C to 50 °C

Calibration point °C	Average of standard reading		Unit under calibration		Expanded uncertainty °C
	Controlled humidity %RH	Temperature °C	Average reading °C	Correction value °C	
20	50	20.00	20.1	- 0.10	± 0.39
25	50	25.00	25.0	0.00	± 0.39
30	50	30.00	29.9	+ 0.10	± 0.39

Humidity measurement

Resolution : 0.1 %RH
Range : 10 %RH to 95 %RH

Calibration point %RH	Average of standard reading		Unit under calibration		Expanded uncertainty %RH
	Air temperature °C	Calculated humidity %RH	Average reading %RH	Correction value %RH	
45	25.02	45.10	48.4	- 3.30	± 1.3
60	25.01	60.07	63.4	- 3.33	± 1.5
75	25.01	75.15	78.5	- 3.35	± 1.7

Notes

- Calibration results without adjustment.

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

- End of Report -

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Rev 00

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WWW.AMARC.CO.TH

Effective Date 15/07/21

Area Heat Stress Monitor

Model : QUESTEMP 34

Serial No. : TEU080014



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD
214 Bangwak Rd. Bangpai Bangkoe Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Customer

Certificate No. : L202406394-0001

Date Issued : 01-Jul-24

: Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment

: Area Heat Stress Monitor

Manufacturer

: TSI

Model

: QUESTEMP 34

Serial No.

: TEU080014

ID No./Tag No.

: NO.13

Date Received

: 28-Jun-24

Date Calibrated

: 28-Jun-24

Calibrated by

: Apiwat Peanrungrath

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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

Result of Calibration

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

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

Approved by:

Saranyuth T.
(Saranyuth Tochua)



Page 1 of 2

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Certificate No. : L202406394-0001

Environment : Ambient Temperature : $(25 \pm 2) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15)\%\text{RH}$

STD Reading ($^\circ\text{C}$)	Before Adjusted	After Adjusted	UUC Error ($^\circ\text{C}$)	Measurement Uncertainty ($\pm^\circ\text{C}$)	MPE ($\pm^\circ\text{C}$)	Pass / Fail Simple Acceptance
37.98	WET 38.0	-	0.02	0.35	0.5	Pass
37.98	DRY 38.0	-	0.02	0.35	0.5	Pass
37.98	GLOBE 38.0	-	0.02	0.35	0.5	Pass
44.99	WET 45.0	-	0.01	0.35	0.5	Pass
44.99	DRY 44.9	-	-0.09	0.35	0.5	Pass
44.99	GLOBE 45.0	-	0.01	0.35	0.5	Pass

STD = Standard

Pass = $|\text{error}| \leq |\text{MPE}|$

UUC = Unit Under Calibration

Fail = $|\text{error}| > |\text{MPE}|$

Description of UUC :

Range

0 to 100 $^\circ\text{C}$

Resolution

0.1 $^\circ\text{C}$

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202310317-0003 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 06-Nov-24

End of Certificate

COPY

Area Heat Stress Monitor

Model : QUESTEMP 32

Serial No. : TPL060040



CALIBRATION CERTIFICATE

Certificate No. : L202405170-0002
 Date Issued : 23-May-24

Customer : Eastern Thai Consulting (1992 Co., Ltd.)
 683 Moo 11, Sukhaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Area Heat Stress Monitor

Manufacturer : QUEST TECHNOLOGY

Model : QUESTEMP 32

Serial No. : TPL060040

ID No./Tag No. : No.5

Date Received : 15-May-24

Date Calibrated : 20-May-24

Calibrated by : Apiwat Peanrungrath

Calibration Method or Calibration Procedure Used


In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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

Result of Calibration

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

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Approved by: 
 (Sarayuth Tochua)



Page 1 of 2

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Certificate No. : L202405170-0002

Environment : Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15)%RH

STD Reading (°C)	Before Adjusted	After Adjusted	UUC Error (°C)	Measurement Uncertainty (±°C)	MPE (±°C)	Pass / Fail Simple Acceptance
37.97	WET 37.9	-	-0.07	0.35	0.5	Pass
37.97	DRY 38.0	-	0.03	0.35	0.5	Pass
37.97	GLOBE 38.1	-	0.13	0.35	0.5	Pass
44.99	WET 45.2	-	0.21	0.35	0.5	Pass
44.99	DRY 44.8	-	-0.19	0.35	0.5	Pass
44.99	GLOBE 44.9	-	-0.09	0.35	0.5	Pass

STD = Standard

Pass = |error| ≤ |MPE|

UUC = Unit Under Calibration

Fail = |error| > |MPE|

Description of UUC :

Range 0 to 100 °C

Resolution

0.1 °C

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202310317-0003 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 06-Nov-24

End of Certificate

Page 2 of 2

Area Heat Stress Monitor

Model : QUESTEMP 34

Serial No. : TEU080015



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Tel. 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.th>



CALIBRATION CERTIFICATE

Customer

Certificate No. : L202406394-0003

Date Issued : 01-Jul-24

: Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment

: Area Heat Stress Monitor

Manufacturer

: TSI

Model

: QUESTEMP 34

Serial No.

: TEU080015

ID No./Tag No.

: NO.14

Date Received

: 28-Jun-24

Date Calibrated

: 28-Jun-24

Calibrated by

: Apiwat Peanrungrath

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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

Result of Calibration

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

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Approved by:

Sarayuth T.
(Sarayuth Tochua)



Page 1 of 2

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Certificate No. : L202406394-0003

Environment : Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15)%RH

STD	Reading (°C)	Before Adjusted	After Adjusted	UUC Error (°C)	Measurement Uncertainty (±°C)	MPE (±°C)	Pass / Fail
37.98	WET	38.1	-	0.12	0.35	0.5	Pass
37.98	DRY	38.2	-	0.22	0.35	0.5	Pass
37.98	GLOBE	37.8	-	-0.18	0.35	0.5	Pass
44.99	WET	45.1	-	0.11	0.35	0.5	Pass
44.99	DRY	45.2	-	0.21	0.35	0.5	Pass
44.99	GLOBE	44.8	-	-0.19	0.35	0.5	Pass

STD = Standard

UUC = Unit Under Calibration

Pass = |error| ≤ |MPE|

Fail = |error| > |MPE|

Description of UUC :

Range

0 to 100 °C

Resolution

0.1 °C

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202310317-0003 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 06-Nov-24

End of Certificate

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Area Heat Stress Monitor

Model : QUESTemp 32

Serial No. : TPI050070



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CALIBRATION CERTIFICATE

Certificate No. : L202401128-0004

Date Issued : 22-Jan-24

Customer : Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11 Sukhapiarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Area Heat Stress Monitor

Manufacturer : QUEST TECHNOLOGY

Model : QUESTEMP 32

Serial No. : TP1050070

ID No./Tag No. : NO.3

Date Received : 17-Jan-24

Date Calibrated : 18-Jan-24

Calibrated by : Mr. Apiwat Peannungrot

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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

Result of Calibration

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

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Page 1 of 2

Approved by: *Saranyuth*
(Mr. Sarayuth Tochua)

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Certificate No. : L202401128-0004

Environment : Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15)%RH

STD	UUC Reading (°C)	UUC Error	Measurement	MPE	Pass / Fail
Reading (°C)	Before Adjusted	After Adjusted	(°C)	Uncertainty (±°C)	with Guard Band
38.01	WET 38.1	-	0.09	0.35	Pass
38.01	DRY 38.2	-	0.19	0.35	Pass
38.01	GLOBE 38.2	-	0.19	0.35	Pass
45.01	WET 44.9	-	-0.11	0.35	Pass
45.01	DRY 44.9	-	-0.11	0.35	Pass
45.01	GLOBE 45.0	-	-0.01	0.35	Pass

STD = Standard

Pass = |error| + |uncertainty| ≤ |MPE|

UUC = Unit Under Calibration

Fail = |error| + |uncertainty| > |MPE|

Description of UUC :

Range

(-5) to 100 °C

Resolution

0.1 °C

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202310317-0003 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 06-Nov-24

End of Certificate

Page 2 of 2

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Area Heat Stress Monitor

Model : QUESTEMP 32

Serial No. : TPI050069



CALIBRATION CERTIFICATE

Certificate No. : L202406394-0002
Date Issued : 01-Jul-24

Customer : Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Area Heat Stress Monitor
Manufacturer : QUEST TECHNOLOGY
Model : QUESTEMP 32
Serial No. : TP1050069
ID No./Tag No. : NO.2
Date Received : 28-Jun-24
Date Calibrated : 28-Jun-24
Calibrated by : Apiwat Peanrungronth

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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

Result of Calibration

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

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Approved by: 
(Sarayuth Tochua)

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Certificate No. : L202406394-0002
Environment : Ambient Temperature : $(25 \pm 2) ^\circ\text{C}$
Relative Humidity : $(50 \pm 15)\%\text{RH}$

STD	UUC Reading ($^\circ\text{C}$)	UUC Error ($^\circ\text{C}$)	Measurement	MPE ($\pm^\circ\text{C}$)	Pass / Fail
Reading ($^\circ\text{C}$)	Before Adjusted	After Adjusted	Uncertainty ($\pm^\circ\text{C}$)		Simple Acceptance
37.98	WET 38.0	-	0.35	0.5	Pass
37.98	DRY 38.0	-	0.35	0.5	Pass
37.98	GLOBE 38.0	-	0.35	0.5	Pass
44.99	WET 45.0	-	0.35	0.5	Pass
44.99	DRY 45.0	-	0.35	0.5	Pass
44.99	GLOBE 45.0	-	0.35	0.5	Pass

STD = Standard
UUC = Unit Under Calibration
Pass = $|\text{error}| \leq |\text{MPE}|$
Fail = $|\text{error}| > |\text{MPE}|$

Description of UUC : Range 0 to 100 $^\circ\text{C}$
Resolution 0.1 $^\circ\text{C}$

Condition As-Received : Used Item
The measurement results and statements of conformity with specification only relate to the item calibrated.
Measurement Standards Used & Traceability :
The International System of Units (SI) through
MIT Certificate No. L202310317-0003 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 06-Nov-24

End of Certificate

Area Heat Stress Monitor

Model : QUESTemp 32

Serial No. : TPL090017



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CALIBRATION CERTIFICATE

Certificate No. : L202401128-0001
Date Issued : 22-Jan-24

Customer : Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11 Sukhaphibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Area Heat Stress Monitor

Manufacturer : QUEST TECHNOLOGY

Model : QUESTEMP 32

Serial No. : TPL090017

ID No./Tag No. : NO.7

Date Received : 17-Jan-24

Date Calibrated : 18-Jan-24

Calibrated by : Mr. Apiwat Peanrungrat

Calibration Method or Calibration Procedure Used

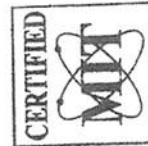
In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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

Result of Calibration

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

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Page 1 of 2

Approved by: *Sorayuth T.*
(Mr. Sarayuth Tochua)

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Certificate No. : L202401128-0001

Environment : Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15)%RH

STD	UUC Reading (°C)	UUC Error	Measurement	MPE	Pass / Fail with Guard Band
Reading (°C)	Before Adjusted	After Adjusted	Uncertainty (±°C)	(±°C)	
38.01	WET	-	0.35	1	Pass
38.01	DRY	-	0.35	1	Pass
38.01	GLOBE	-	0.35	1	Pass
45.01	WET	-	0.35	1	Pass
45.01	DRY	-	0.35	1	Pass
45.01	GLOBE	-	0.35	1	Pass

STD = Standard

Pass = |error| + |uncertainty| ≤ |MPE|

UUC = Unit Under Calibration

Fail = |error| + |uncertainty| > |MPE|

Description of UUC : Range (-5) to 100 °C
Resolution 0.1 °C

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202310317-0003 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 06-Nov-24

End of Certificate

Page 2 of 2

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Area Heat Stress Monitor

Model : QUESTEMP 34

Serial No. : TEU080012



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CALIBRATION CERTIFICATE

Customer

: Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11, Sukhapibarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment

: Area Heat Stress Monitor

Manufacturer

: TSI

Model

: QUESTEMP 34

Serial No.

: TEU080012

ID No./Tag No.

: NO.11

Date Received

: 10-Jun-24

Date Calibrated

: 10-Jun-24

Calibrated by

: Apiwat Peanrungrath

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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

Result of Calibration

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

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Approved by:

Sarayuth T
(Sarayuth Tochua)



Page 1 of 2

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Certificate No. : L202406089-0002

Environment : Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15)%RH

STD	UUC Reading (°C)	UUC Error (°C)	Measurement	MPE (±°C)	Pass / Fail
Reading (°C)	Before Adjusted	After Adjusted	Uncertainty (±°C)		Simple Acceptance
38.00	WET 38.0	-	0.35	0.5	Pass
38.00	DRY 37.8	-	0.35	0.5	Pass
38.00	GLOBE 37.9	-	0.35	0.5	Pass
44.99	WET 45.2	-	0.35	0.5	Pass
44.99	DRY 45.0	-	0.35	0.5	Pass
44.99	GLOBE 44.9	-	0.35	0.5	Pass

STD = Standard

Pass = |error| ≤ |MPE|

UUC = Unit Under Calibration

Fail = |error| > |MPE|

Description of UUC :

Range 0 to 100 °C

Resolution

0.1 °C

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202310317-0003 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 06-Nov-24

End of Certificate

Page 2 of 2

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Area Heat Stress Monitor

Model : QUESTEMP 34

Serial No. : TEU080013



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Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.in.th>



CALIBRATION CERTIFICATE

Customer

: Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11, Sukhapibarn 8 Rd., Nongkhram, Sriracha, Chonburi 20230

Equipment

: Area Heat Stress Monitor

Manufacturer

: TSI

Model

: QUESTEMP 34

Serial No.

: TEU080013

ID No./Tag No.

: NO.12

Date Received

: 10-Jun-24

Date Calibrated

: 10-Jun-24

Calibrated by

: Apiwat Peanrungrath

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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

Result of Calibration

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

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

Approved by:

Sarayuth T.
(Sarayuth Tochua)



Page 1 of 2

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Certificate No. : L202406089-0003

Environment : Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15)%RH

STD	UUC Reading (°C)	Before Adjusted	After Adjusted	UUC Error (°C)	Measurement	MPE (±°C)	Pass / Fail
Reading (°C)					Uncertainty (±°C)		Simple Acceptance
38.00	WET	37.8	-	-0.20	0.35	0.5	Pass
38.00	DRY	38.0	-	0.00	0.35	0.5	Pass
38.00	GLOBE	37.7	-	-0.30	0.35	0.5	Pass
44.99	WET	44.9	-	-0.09	0.35	0.5	Pass
44.99	DRY	45.2	-	0.21	0.35	0.5	Pass
44.99	GLOBE	44.8	-	-0.19	0.35	0.5	Pass

STD = Standard

Pass = |error| ≤ |MPE|

UUC = Unit Under Calibration

Fail = |error| > |MPE|

Description of UUC :

Range

0 to 100 °C

Resolution

0.1 °C

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202310317-0003 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 06-Nov-24

End of Certificate

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Area Heat Stress Monitor

Model : QUESTEMP 34

Serial No. : TEU080011



CALIBRATION CERTIFICATE

Certificate No. : L202406089-0001

Date Issued : 12-Jun-24

Customer : Eastern Thai Consulting 1992 Co., Ltd.
 683 Moo 11, Sukhapibam 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment : Area Heat Stress Monitor

Manufacturer : TSI

Model : QUESTEMP 34

Serial No. : TEU080011

ID No./Tag No. : NO.10

Date Received : 10-Jun-24

Date Calibrated : 10-Jun-24

Calibrated by : Apiwat Peanrungronth

Calibration Method or Calibration Procedure Used

In-house method : CP-19 by comparing against Standard Digital Humidity / Temperature Meter

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

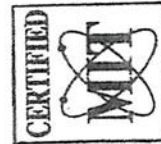
Result of Calibration

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

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

Approved by:

Saranyuth T.
 (Saranyuth Tochua)



Page 1 of 2

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Certificate No. : L202406089-0001

Environment : Ambient Temperature : (25 ± 2) °C

Relative Humidity : (50 ± 15)%RH

STD Reading (°C)	UUC Before Adjusted	UUC After Adjusted (°C)	UUC Error (°C)	Measurement Uncertainty (±°C)	MPE (±°C)	Pass / Fail Simple Acceptance
38.00	WET 38.1	-	0.10	0.35	0.5	Pass
38.00	DRY 37.8	-	-0.20	0.35	0.5	Pass
38.00	GLOBE 38.2	-	0.20	0.35	0.5	Pass
44.99	WET 44.9	-	-0.09	0.35	0.5	Pass
44.99	DRY 44.7	-	-0.29	0.35	0.5	Pass
44.99	GLOBE 45.1	-	0.11	0.35	0.5	Pass

STD = Standard

Pass = |error| ≤ |MPE|

UUC = Unit Under Calibration

Fail = |error| > |MPE|

Description of UUC :

Range

0 to 100 °C

Resolution

0.1 °C

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

MIT Certificate No. L202310317-0003 for Digital Thermometer with Probe (Fluke) Serial No. 5856603, Due 06-Nov-24

End of Certificate

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DIGITAL LIGHT METER

Model : LX-73

Serial No. : S.008890



CALIBRATION LABORATORY CO., LTD.

210-11, 14, 55 Soi Prasert Manukul 29 Yaek 4, Prasert Manukul Rd, Ladprao Bangkok 10230
Tel 02-578-0353-4 Fax 02-578-2672 www.calibration.com E-mail: info@calibration.com



CERTIFICATE OF CALIBRATION

FOR

NOMENCLATURE : LIGHT METER
MANUFACTURER : DIGICON
MODEL / TYPE : LX-73
SERIAL NO. : S.008890
CLID. NO. : 252400286
JOB CONTROL NO. : 240208013830
CALIBRATION SERVICE : ☒ IN-LABORATORY ☐ ON-SITE

CUSTOMER : EASTERN THAI CONSULTING 1992 CO., LTD.
683 MOO 11, SUKHAPIBARN 8 RD,
NONGKHAM, SRIRACHA, CHONBURI 20230

DATE OF RECEIVED : 08 February 2024

DATE OF ISSUED : 12 February 2024

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

Calibrated By :

Suwit Phuanbusabong

Calibration Engineer



Approved By :

Mongkol Yotsoontorn

Authorized Signatory

12 February 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. Q24013830

F3-011-05/12-23



page 1 of 3

@calibration



CALIBRATION LABORATORY CO., LTD.

210-11, 14, 55 Soi Prasert Manukul 29 Yaek 4, Prasert Manukul Rd, Ladprao Bangkok 10230
Tel 02-578-0353-4 Fax 02-578-2672 www.calibration.com E-mail: info@calibration.com



REPORT OF CALIBRATION

FOR

NOMENCLATURE : LIGHT METER
MANUFACTURER : DIGICON
MODEL / TYPE : LX-73
SERIAL NO. : S.008890
DATE OF CALIBRATION : 09 February 2024

ENVIRONMENT CONDITIONS :

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

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

PROCEDURE USED :

This instrument was calibrated under procedure No. CLC-CPEE-18 by comparison with Photometer/Radiometer & Illuminance Sensor which maintained by the Calibration Laboratory Co., Ltd.

REFERENCE STANDARD USED :

Photometer/Radiometer & Illuminance Sensor, Bentham Model ORM400/DH400VL S/N. 27710,27585/3.

TRACEABILITY :

The measurements are traceable to International System of Units (SI), through Optical Test and Calibration Ltd. Certificate No. 144408/ABU, Due Date 03 April 2024.

UNCERTAINTY :

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2.00$ which for a normal distribution corresponds to a coverage probability of approximately 95 %. It has been evaluated according to the "Evaluation of the Uncertainty of Measurement in Calibration (EA-4/02 M:2022)"

Certificate No. Q24013830

F3-011-05/12-23



page 2 of 3



@calibration



CALIBRATION LABORATORY CO., LTD.

2109-11-55 50 Prasart Manu : 29 Yak 1 Prasart Manu Ho Ladhra, Gangkok 1030
Tel 02-578-0353-4 Fax 02-578-2972 www.cclab.co.th E-mail: info@cclab.co.th



CONDITION OF CALIBRATION ITEM : RECEIVED IN GOOD OPERATIONAL CONDITION
MEASUREMENT RESULTS : (X) without adjustment () adjustment
CALIBRATION DATA

LIGHT METER RESULT

STD Applied (lux)	DUC Reading (lux)	Correction (lux)	Uncertainty \pm (% of rdg.)
0.00	0.00	0.00	-
10.00	10.04	-0.04	3.1
50.0	50.2	-0.2	2.6
100.0	100.1	-0.1	2.6
200.0	199.7	+0.3	2.6
300.0	299.2	+0.8	2.6
400.0	398.5	+1.5	2.6
500	503	-3	2.6
1000	999	+1	2.6
2000	1992	+8	2.6
3000	2989	-11	2.6
4000	3984	+16	3.6
5000	5020	-20	3.6

Note. The Scope of Accredited ANAB Certificate No. ACDM-2814 Version 012 Page 55 of 67

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

End of Certificate

Certificate No. Q24013830

F3-011-05/12-23

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page 3 of 3



ANALYTICAL BALANCE (DU)

Model : XS205DU

Serial No. : 1126323724



Certificate No. : 23-148799

Sample Code : 23-56200-001

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.
683 Moo 11, Sukhapiarn 8 Rd., Nongkham,
Siracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.
(Analytical Balance Room)

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Serial No. : 1126323724

ID No. : LABE 05/1

Date of Receipt : 22 December 2023

Date of Calibration : 22 December 2023

Calibrated by : Mr. Somwang Sangdee
Scientist

Issue date : 25 December 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).



Certificate No. : 23-148799

Sample Code : 23-56200-001

REPORT OF CALIBRATION

Equipment : ELECTRONIC BALANCE

Manufacturer : METTLER TOLEDO

Model : XS205DU

Capacity : Max 81 g / 220 g

Resolution : 0.01 mg / 0.1 mg

Serial No. : 1126323724

ID No. : LABE 05/1

Result of Calibration

1. Test weight and repeatability of reading

Repeatability is a measure of the ability of a balance to supply the same result in repetitive weighings with one and the same load under the same measurement condition. The measurement of the repeatability must include both the balance specifications and the ambient (vibration, fluctuating air current/temperature/humidity, etc.) Operator handling of the balance is also included in the standard deviation.

Unit : g	Range : 80	<input checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	40 80 40 80	
<input checked="" type="checkbox"/> Adjustment	Standard weight	40.000054 80.000048 40.000054 80.000048	
	Average reading of indicator	40.000026 80.000037 40.000017 80.000017	
	Standard deviation	0.000015 0.000016 0.000008 0.000009	
Unit : g	Range : 200	<input checked="" type="checkbox"/> Before adjustment	<input checked="" type="checkbox"/> After adjustment
<input type="checkbox"/> No adjustment	Nominal value	100 200 100 200	
<input checked="" type="checkbox"/> Adjustment	Standard weight	100.000042 200.000041 100.000042 200.000041	
	Average reading of indicator	100.00003 200.00004 100.00001 200.00001	
	Standard deviation	0.000005 0.000005 0.000003 0.000005	

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Certificate No. : 23-148799

Sample Code : 23-56200-001

REPORT OF CALIBRATION

Result of Calibration

2. Sensitivity or value of a scale division

Change in the output variable of a measuring instrument divided by the associated change in the input variable.

Unit : g

Range : 80 200

Test Point	Sensitivity, S	Test Point	Sensitivity, S
0	1.00748	0	1.0274
40	0.98753	100	0.9975
80	0.99751	200	0.9975

3. Departure of indication from nominal value, Linearity

Unit : g

Nominal Value	Standard Value	Average Reading of Indicator	Correction Value	Expanded Uncertainty	Coverage Factor (k)
Unload	0.0000000	0.00000	0.00000	0.000012	2.05
0.01	0.0100025	0.01000	0.00000	0.000012	2.05
0.1	0.1000019	0.10001	-0.00001	0.000013	2.03
1	1.0000125	1.00001	0.00000	0.000015	2.02
5	5.0000208	5.00004	-0.00002	0.000021	2.00
10	10.0000004	10.00008	-0.00008	0.000026	2.00
20	20.0000030	20.00011	-0.00008	0.000036	2.00
50	50.0000014	50.00014	-0.00013	0.000068	2.00
100	100.0000042	100.00001	-0.00001	0.00016	2.00
150	150.0000056	150.00001	0.00000	0.00022	2.00
200	200.0000041	200.00002	-0.00002	0.00027	2.00

The result expanded uncertainty of measurement U is stated as the standard uncertainty multiplied by the coverage factor k , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003.

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Certificate No. : 23-148799

Sample Code : 23-56200-001

REPORT OF CALIBRATION

Result of Calibration :

4. Eccentric or off-centre loading

Deviation of the measurement value through off-center (eccentric) loading. The corner load increases with the weight of the load and its removal from the center of the pan support.

Weighing pan ☐ Circle ☐ Triangular ☒ Rectangular

Test weight : 50 and 100
Unit : g

Range	Position	Reading of indicator	Reading of indicator
1	50.00015	100.0001	200
2	50.00022	100.0001	100.0001
3	50.00008	100.0001	100.0001
4	50.00002	100.0000	100.0000
5	50.00016	100.0002	100.0002
6	50.00014	100.0001	100.0001
Maximum difference	0.00013	0.0001	

Condition of Calibration

1. Calibration Method : WI-CL-004 base on UKAS LAB 14: 2019
2. This result of calibration was found accurate as shown on date and place of calibration only.
3. Condition of Calibration item: Normal
4. This certification is traceable to the International System of Unit maintained at :-
Through the reference standard laboratory of Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (Instrument number 1).
5. Reference standard instrument :
Instrument
1) STANDARD WEIGHT 1 mg to 1 kg

Ambient conditions	Min	Max
Temperature (°C)	22.8	23.0
Relative Humidity (%Rh)	43.5	51.1
Air pressure (hPa)	1012.5	1014.5

Class ID No. Certificate No. Due Date
E2 LB-WE-79 23-105642 10 September 2024

End of Report

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BAROMETER

Equipment : Analog Barometer

ID No. / Tag No. : BM001/41



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD
214 Bangwaek Rd. Bangpai Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mti.in.th>



CALIBRATION CERTIFICATE

Certificate No. : L202405022-0013

Date Issued : 08-May-24

Customer

: Eastern Thai Consulting 1992 Co., Ltd.
683 Moo 11, Sukhapiarn 8 Rd., Nongkham, Sriracha, Chonburi 20230

Equipment

: Analog Barometer

Manufacturer

: Barigo

Model

: -

Serial No.

: -

ID No./Tag No.

: BM001/41

Date Received

: 03-May-24

Date Calibrated

: 06-May-24

Calibrated by

: Mr. Saruth Srithulikul

Calibration Method or Calibration Procedure Used

In-house method : CP-21 base on DKD-R 6-1: Edition 3 2014.

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

Result of Calibration

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

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

Approved by:

Saranyuth T.
(Mr. Saranyuth Tochua)

Page 1 of 2



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Certificate No : L202405022-0013

Environment Ambient Temperature : (25 ± 2)°C
Relative Humidity : (50 ± 15)%RH

STD Reading	UUC Reading (mbar)	UUC Reading (mbar)	UUC Error	Uncertainty	MPE	Pass / Fail
mbar	Before Adjusted	After Adjusted	mbar	± mbar	± mbar	with Guard Band
990.00	990	-	0.00	0.59	10.3	Pass
1000.00	1000	-	0.00	0.59	10.3	Pass
1010.00	1010	-	0.00	0.59	10.3	Pass
1020.00	1020	-	0.00	0.59	10.3	Pass
1030.00	1030	-	0.00	0.59	10.3	Pass

STD = Standard Pass = $|\text{error}| + |\text{uncertainty}| \leq |\text{MPE}|$

UUC = Unit Under Calibration Fail = $|\text{error}| + |\text{uncertainty}| > |\text{MPE}|$

MPE = Maximum Permissible Error

Calibrated condition : Pressure Medium Air : Density = 1.19 kg/m³ @ 20°C, 1 bar
Mounting Position Vertical
Reference Level at center of its dial
Conversion Factor Multiply by 1.0 E+02 - Pa unit

Description of UUC :

Range	950 - 1080	mbar Absolute
Calibration Range	990 - 1030	mbar Absolute
Scale Interval	1	mbar

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Measurement Standards Used & Traceability :

The International System of Units (SI) through

IRPC Certificate No. CL1-P230097 for Reference Pressure Monitor Serial No. 1598. Due 09-Nov-24

End of Certificate

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Page 2 of 2

Hot Air Oven

Model : UFE 500

Serial No. : G511.0182

NSC-TSI-TSI7025
CALIBRATION 0152

Page 1 of 3

Certificate No. : 23-148804

Sample Code : 23-56200-006

CERTIFICATE OF CALIBRATION

Customer : EASTERN THAI CONSULTING 1992 CO., LTD.

683 Moo 11, Sukhapibarn 8 Rd., Nongkham,

Sriracha, Chonburi 20230

Location of Calibration : EASTERN THAI CONSULTING 1992 CO., LTD.

(Hot Lab)

Equipment : Temperature controlled enclosures (Hot air oven)

Manufacturer : Memmert Model : UFE 500

Serial No. : G511.0182 ID No. : LABE 17/4

Date of Receipt : 22 December 2023 Date of Calibration : 22 December 2023

Condition of Calibration

1. Environment	1.1 Ambient temperature	: Maximum	30.9 °C	: Minimum	29.6 °C
	1.2 Relative humidity	: Maximum	54.5 %	: Minimum	46.8 %
	1.3 Line voltage supplied	: Maximum	227.6 VAC	: Minimum	224.2 VAC

2. Calibration method

TLAS-G-20: Guidelines for calibration and checks of temperature controlled enclosures.

3. Reference standard instrument

Instrument	ID No.	Certificate No.	Due Date
Data Acquisition With Sensor (RTD-P100)	LB-DA-08 (RTD-248 to RTD-256)	23-084070	06 August 2024

4. This certificate is traceable to the international system of unit (SI Unit).

The measurement is traceable to Asia Medical and Agricultural Laboratory and Research Center Public Company Limited.

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

6. Condition of calibration item : Normal

Calibrated by

Mr. Pisek Into

Approved by

(Mr. Somchai Neampunt)

Scientist

Signed for Director

Issue date

25 December 2023

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

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

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 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 Asia Medical and Agricultural Laboratory and Research Center Public Company Limited (AMARC).

361 Soi Ladprao 122, Ladprao Road,
Phlabphla, Wang Thonglang, Bangkok 10310
RM CL 014TEL 02-516-2422
FAX 02-516-6949
Rev 01CONTACT@AMARC.CO.TH
WWW.AMARC.CO.TH
Effective Date 15/10/21NSC-TSI-TSI7025
CALIBRATION 0152

Page 2 of 3

Certificate No. : 23-148804

Sample Code : 23-56200-006

REPORT OF CALIBRATION

Results of Calibration

Resolution : 0.5 °C

1. Reporting of Temperature

Calibration point (°C)	UUC* setting (°C) reading (°C)	Measured temperature at each positions (°C)									Uncertainty ± (°C)	Coverage factor k
		# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9 ^{out}		
104	103.5	104.11	103.94	103.85	103.84	103.97	103.93	103.64	103.51	104.23	0.47	2.00

2. Characterization results

Calibration point (°C)	Stability ± (°C)	Uniformity (°C)	Overall variation (°C)
104	0.04	0.78	0.81

Notes

UUC* = Unit Under Calibration

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TEL 02-516-2422
FAX 02-516-6949
Rev 09361 Soi Ladprao 122, Ladprao Road,
Phlabphla, Wang Thonglang, Bangkok 10310
RM CL 018CONTACT@AMARC.CO.TH
WWW.AMARC.CO.TH
Effective Date 15/10/21

REPORT OF CALIBRATION

Certificate No. : 23-148804
Sample Code : 23-56200-006

Results of Calibration

Notes

- Sensor installation locations
 - All sensors at any corners or walls should be positioned 5 cm (a x b x c) from the wall.
 - The reference sensor is preferably located at the geometric center of the chamber.
- Interior dimensions approx of chamber :
W = 56 cm ; D = 40 cm ; H = 48 cm
- Air valve or fresh air level : Off
- Fan level : Open
- The quoted uncertainty includes "Stability of chamber and loading effect in chamber at 20% of uniformity".
- 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.
- Stability - one-half of the greatest maximum difference of measured temperatures at any one sensor.
- Overall variation - the difference of the maximum and the minimum measured temperatures throughout observation time.
- UUC* reading - the average reading of indicating device that forms the integral part of the enclosure.
- Calibration results without adjustment.

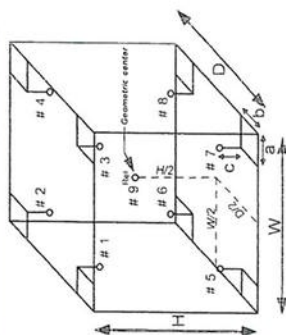


Figure: Example of sensor installation Positions

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%. The standard uncertainty of measurement has been determined in accordance with UKAS M3003

End of Report

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Primary Flow Calibrator
Serial No. : 110619 , 207510

Certificate of Calibration

Customer

Name : Eastern Thai Consulting 1992 Co., Ltd.

Address : 683 Moo 11, Sukhapham 8 Rd., Nongkham, Sriracha, Chonburi 20230

Unit Under Calibration Details

Measurement Item : Primary Flow Calibrator

Manufacturer : Bios

Model : Defender 510-L

Serial Number : I10619

ID : -

Sensor Model : -

Sensor Serial Number : -

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 hPa ± 10 hPa

Received Date : 11 January 2024

Calibration Date : 30 January 2024

Calibration Procedure : In-house method CP-AFM-01 by Comparison technique with Standard Primary Flow Calibrator

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Air Flow Meter	Gilibrator 3 Low flow	18501010006	Sensidyne	12 July 2024
Air Flow Meter	Gilibrator 3 Standard flow	19031011003	Sensidyne	12 July 2024
Temperature meter	GT 11	08000057	Qreborn	27 February 2024
Pressure meter	CPG2400	41000KDU/651882	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 :  **Approved By :** 

Mr. Noppadon Luangart **Mr. Paat Mathavorn**

Service Calibration Engineer **Calibration Engineer Supervisor**

Issue Date : 30 January 2024

Result of Calibration : Without Adjustment

Temperature (°C)	Pressure (kPa)	STD (cc/min)	UUC (cc/min)	Error (cc/min)	Uncertainty (cc/min)
24.80	101.23	0	0.00	0.0080	0.0058
24.40	101.18	50	49.629	-0.4	3.3
24.40	101.16	100	100.73	0.7	2.8
24.30	101.13	200	198.30	-1.7	5.6
24.30	101.10	300	298.14	-1.9	8.4
24.40	101.06	400	397.45	-3	11
24.20	101.00	500	496.93	-3.1	7.1

Note

STD : Standard UUC : Unit Under Calibration

- UUC Reference Condition : At atmospheric pressure and room temperature condition
- 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

* Indicates non accredited

End of Certificate

COPY

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NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CA8889



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory
N Smith
Electronically signed:


Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc Notes: Eastern Thai Consulting 1992 Co.Ltd
Model: CR:110A 683 Moo.11, Sukaphibai 8 Rd., Nongkham,
Serial number: CA8889 Shiracha, Chonburi 20230
Firmware version: 5.4

Test summary

Date of calibration: 19 January 2024
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE-952	78713
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	100498

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:
206918

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 100.96 kPa Temperature: 21.6 °C Humidity: 34.6 %
After Pressure: 100.94 kPa Temperature: 21.5 °C Humidity: 34.4 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

COPY

NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CA8887



Cirrus Research plc

Acoustic House

Bridlington Road

Hummanby

North Yorkshire

YO14 0PH

United Kingdom

Page 1 of 2

Approved signatory
N.Smith

Electronically signed:


Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc
Model: CR-110A
Serial number: CA8887
Firmware version: 5.4

Notes: Eastern Thai Consulting 1992 Co. Ltd.
883 Moo.11, Sukaphibal 8 Rd., Nongkham,
Sriacha, Chonburi 20230

Test summary

Date of calibration: 19 January 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE:952	78713
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC-110A	100498

Notes

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Environmental conditions

The following conditions were recorded at the time of the test:

Before	Pressure:	100.93 kPa	Temperature:	21.6 °C	Humidity:	35.4 %
After	Pressure:	100.92 kPa	Temperature:	21.6 °C	Humidity:	36.4 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

COPY

NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CA8886

CERTIFICATE OF CALIBRATION

ISSUED BY

Cirrus Research plc

DATE OF ISSUE

19 January 2024

CERTIFICATE NUMBER

206869

CERTIFICATE OF CALIBRATION

Certificate Number:

206869

Page

2 of 2



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory

N Smith

Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc
Model: CR-110A
Serial number: CA8886
Firmware version: 5.4
Notes: Eastern Thai Consulting 1992 Co., Ltd.
663 Moo.11, Sukaphibai 8 Rd., Nongkham,
Siriracha, Chonburi 20230

Test summary

Date of calibration: 19 January 2024
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG 1032X	SDG1XDD06R6309
Attenuator	Cirrus Research	ZE:952	93892
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC-110A	40088

Notes

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Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 100.96 kPa Temperature: 21.5 °C Humidity: 35.2 %
After Pressure: 100.96 kPa Temperature: 21.6 °C Humidity: 33.4 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighing	Complies
Absolute Acoustic Sensitivity	Complies

COPY

COPY

NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB0643

CERTIFICATE OF CALIBRATION

ISSUED BY

Cirrus Research plc

DATE OF ISSUE

19 January 2024

CERTIFICATE NUMBER

206871

CERTIFICATE OF CALIBRATION

Certificate Number:

206871

Page

2 of 2



Cirrus Research plc

Acoustic House

Bridlington Road

Hunmanby

North Yorkshire

YO14 0PH

United Kingdom

Page 1 of 2

Approved signatory

N.Smith

Electronically signed:



Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer:

Cirrus Research plc

Model:

CR:110A

Serial number:

CB0643

Firmware version:

5.4

Notes:

Eastern Thai Consulting 1992 Co., Ltd.

683 Moo.11, Sukaphibai 8 Rd., Nongkham,

Sriracha, Chonburi 20230

Test summary

Date of calibration:

19 January 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDDQ8R6309
Attenuator	Cirrus Research	ZE:952	93892
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	40088

Notes

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Environmental conditions

The following conditions were recorded at the time of the test:

Before

Pressure: 100.93 kPa

Temperature: 21.6 °C

Humidity: 36.1 %

After

Pressure: 100.92 kPa

Temperature: 21.5 °C

Humidity: 35.5 %

Test results summary

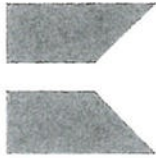
Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CA8888



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory
N Smith

Electronically signed

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:110A
Serial number: CA8888
Firmware version: 5.4

Notes: Eastern Thai Consulting 1992 Co.,Ltd.
683 Moo.11, Sukaphibal 8 Rd., Nongkham,
Sriacha, Chonburi 20230

Test summary

Date of calibration: 19 January 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE:952	78713
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	100498

Notes

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Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 100.93 kPa Temperature: 21.4 °C Humidity: 34.6 %
After Pressure: 100.92 kPa Temperature: 21.6 °C Humidity: 35.3 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

COPY

NOISE DOSI METER

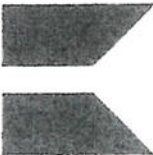
MODEL : CR:110A

SERIAL No. : CB0958

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 19 January 2024 CERTIFICATE NUMBER 206885



Cirrus Research plc
Acoustic House
Bridlington Road
Hummanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2
Approved signatory
N. Smith
Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc Notes: Eastern Thai Consulting 1992 Co.,Ltd.
Model: CR:110A 683 Moo 11, Sukaphibai 8 Rd., Nongkham,
Serial number: CB0958 Siracha, Chonburi 20230
Firmware version: 5.4

Test summary

Date of calibration: 19 January 2024
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE:952	78713
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	100498

Notes

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CERTIFICATE OF CALIBRATION

Certificate Number:
206885

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 100.06 kPa Temperature: 21.9 °C Humidity: 35.6 %
After Pressure: 100.10 kPa Temperature: 21.9 °C Humidity: 37.4 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

COPY

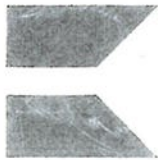
NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB0641

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 19 January 2024
CERTIFICATE NUMBER 206878



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2
Approved signatory
N Smith
Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc
Model: CR-110A
Serial number: CB0641
Firmware version: 5.4
Notes: Eastern Thai Consulting 1992 Co., Ltd.
683 Moo.11, Sukaphibal 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Test summary

Date of calibration: 19 January 2024
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY98001553
Attenuator	Cirrus Research	ZE:952	78713
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	100498

Notes

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COPY

CERTIFICATE OF CALIBRATION

Certificate Number:
206878
Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test

Before Pressure: 100.96 kPa Temperature: 21.6 °C Humidity: 33.5 %
After Pressure: 100.96 kPa Temperature: 21.5 °C Humidity: 34.9 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

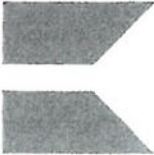
NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB0640

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 19 January 2024 CERTIFICATE NUMBER 206879



Cirrus Research plc
Acoustic House
Bridlington Road
Hummarby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2
Approved signatory N Smith
Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc Notes: Eastern Thai Consulting 1992 Co., Ltd.
Model: CR:110A 683 Moo.11, Sukaphibai 8 Rd., Nongkham,
Serial number: CB0640 Sriracha, Chonburi 20230
Firmware version: 5.4

Test summary

Date of calibration: 19 January 2024
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE-952	78713
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	100498

Notes

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CERTIFICATE OF CALIBRATION

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 99.84 kPa Temperature: 21.4 °C Humidity: 32.5 %
After Pressure: 99.87 kPa Temperature: 21.7 °C Humidity: 33.5 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

COPY

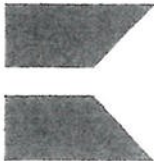
NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CA8879

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 19 January 2024 CERTIFICATE NUMBER 206901



Cirrus Research plc
Acoustic House
Bridlington Road
Hummanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2
Approved signatory
N Smith
Electronically signed:

N. Smith

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc Notes: Eastern Thai Consulting 1992 Co., Ltd.
Model: CR:110A 683 Moo 11, Sukaphibai 8 Rd., Nongkham,
Serial number: CA8879 Sriracha, Chonburi 20230
Firmware version: 5.4

Test summary

Date of calibration: 19 January 2024
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG 1032X	SDG1XDDQ6R6309
Attenuator	Cirrus Research	ZE:952	93892
Environmental Monitor	Comet	T7510	18966334
doseBadge Reader	Cirrus Research plc	RC:110A	40088

Notes

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CERTIFICATE OF CALIBRATION

Certificate Number:
206901
Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 100.92 kPa Temperature: 21.6 °C Humidity: 35.3 %
After Pressure: 100.93 kPa Temperature: 21.7 °C Humidity: 40.1 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

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NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB1500

CERTIFICATE OF CALIBRATION

ISSUED BY

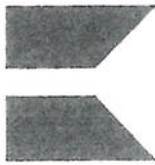
Cirrus Research plc

DATE OF ISSUE

19 January 2024

CERTIFICATE NUMBER

206866



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory

N Smith

Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:110A
Serial number: CB1500
Firmware version: 5.4

Notes: Eastern Thai Consulting 1992 Co.,Ltd.
683 Moo.11, Sukaphibai 8 Rd., Nongkham,
Sriacha, Chonburi 20230

Test summary

Date of calibration: 19 January 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDDQ6R6309
Attenuator	Cirrus Research	ZE:952	93892
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	40088

Notes

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CERTIFICATE OF CALIBRATION

Certificate Number:

206866

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 100.96 kPa Temperature: 21.6 °C Humidity: 34.1 %
After Pressure: 100.95 kPa Temperature: 21.6 °C Humidity: 34.7 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

COPY

NOISE DOSI METER

MODEL : CR:110A

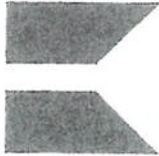
SERIAL No. : CB0955

CERTIFICATE OF CALIBRATION

ISSUED BY
Cirrus Research plc


DATE OF ISSUE
19 January 2024

CERTIFICATE NUMBER
206865



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory
N.Smith
Electronically signed:


Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:110A
Serial number: CB0955
Firmware version: 5.4

Notes: Eastern Thai Consulting 1992 Co.,Ltd.
683 Moo.11, Sukaphibai 8 Rd., Nongkham,
Sriacha, Chonburi 20230

Test summary

Date of calibration: 19 January 2024
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDDQ6R6309
Attenuator	Cirrus Research	ZE-952	93892
Environmental Monitor	Comet	T7510	18966334
doseBadge Reader	Cirrus Research plc	RC:110A	40088

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results in this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:
206865

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test

Before	Pressure: 100.95 kPa	Temperature: 21.5 °C	Humidity: 35.2 %
After	Pressure: 100.93 kPa	Temperature: 21.7 °C	Humidity: 35.7 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

COPY

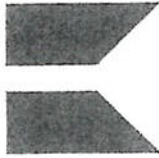
NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB0956

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 19 January 2024 CERTIFICATE NUMBER 206875



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2
Approved signatory
N Smith
Electronically signed:

Dosemeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc
Model: CR:110A
Serial number: CB0956
Firmware version: 5.4
Notes: Eastern Thai Consulting 1992 Co., Ltd.
683 Moo.11, Sukaphibai 8 Rd., Nongkham,
Sriacha, Chonburi 20230

Test summary

Date of calibration: 19 January 2024
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDDQ6R6309
Attenuator	Cirrus Research	ZE:952	93892
Environmental Monitor	Cornet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	40088

Notes

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CERTIFICATE OF CALIBRATION

Certificate Number:
206875
Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 100.92 kPa Temperature: 21.7 °C Humidity: 36.0 %
After Pressure: 100.93 kPa Temperature: 21.5 °C Humidity: 35.9 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

COPY

NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB0644

CERTIFICATE OF CALIBRATION

DATE OF ISSUE 19 January 2024 CERTIFICATE NUMBER 206923

Approved signatory
N.Smith
Electronically signed:

Page 1 of 2

Approved signatory
N.Smith

Electronically signed:

YO14 0PH
United Kingdom

20

Notes: Eastern Thai Consulting 1992 Co.,Ltd.
683 Moo.11, Sukaphibai 8 Rd., Nongkham,
Sriacha, Chonburi 20230

Model: CR:110A

Serial number: CB0644

Firmware version: 5.4

② Date of calibration: 19 January 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The calibration was performed respecting the requirements of ISO/IEC 17025:2017

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE:952	78713
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	100498

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1000

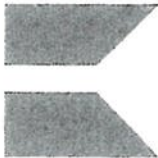
NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB0642

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 19 January 2024 CERTIFICATE NUMBER 206920



Cirrus Research plc
Acoustic House
Bridlington Road
Hummanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2
Approved signatory
N. Smith
Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc Notes: Eastern Thai Consulting 1992 Co.,Ltd.
Model: CR:110A 663 Moo.11, Sukaphibai 8 Rd., Nongkham,
Serial number: CB0642 Sriracha, Chonburi 20230
Firmware version: 5.4

Test summary

Date of calibration: 19 January 2024
No calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33611B	MY58001553
Attenuator	Cirrus Research	ZE-952	78713
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	100498

Notes

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CERTIFICATE OF CALIBRATION

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 100.02 kPa Temperature: 21.9 °C Humidity: 34.6 %
After Pressure: 100.03 kPa Temperature: 21.8 °C Humidity: 36.1 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

COPY

NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB1365

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 19 January 2024 CERTIFICATE NUMBER 206870



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2
Approved signatory N Smith
Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc Notes: Eastern Thai Consulting 1992 Co.,Ltd.
Model: CR:110A 683 Moo 11, Sukaphibai 8 Rd., Nongkham,
Serial number: CB1365 Sriracha, Chonburi 20230
Firmware version: 5.4

Test summary

Date of calibration: 19 January 2024
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE:952	78713
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	100498

Notes

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CERTIFICATE OF CALIBRATION

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 99.92 kPa Temperature: 21.7 °C Humidity: 33.2 %
After Pressure: 99.96 kPa Temperature: 21.8 °C Humidity: 34.2 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

Certificate Number: 206870
Page 2 of 2

COPY

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NOISE DOSI METER

MODEL : CR:110A


SERIAL No. : CB1497

CERTIFICATE OF CALIBRATION

ISSUED BY
Cirrus Research plc

DATE OF ISSUE
19 January 2024

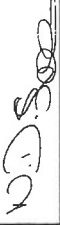
CERTIFICATE NUMBER
206868



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory
N Smith

Electronically signed:


Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer:
Model:
Serial number:
Firmware version:

Cirrus Research plc
CR:110A
CB1497
5.4

Notes:
Eastern Thai Consulting 1992 Co.,Ltd.
683 Moo.11, Sukaphibal 8 Rd., Nongkham,
Sriacha, Chonburi 20230

Test summary

Date of calibration:
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

19 January 2024

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE:952	78713
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	100498

Notes

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CERTIFICATE OF CALIBRATION

Certificate Number.
206868

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test

Before

Pressure: 100.13 kPa
Temperature: 22.0 °C
Humidity: 37.0 %

After

Pressure: 100.15 kPa
Temperature: 21.9 °C
Humidity: 35.4 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

COPY

NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB1499

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 19 January 2024 CERTIFICATE NUMBER 206881



Cirrus Research plc
Acoustic House
Bridlington Road
Hummanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory
N Smith
Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc Notes: Eastern Thai Consulting 1992 Co.,Ltd.
Model: CR:110A 683 Moo.11, Sukaphibai 8 Rd., Nongkham,
Serial number: CB1499 Sriracha, Chonburi 20230
Firmware version: 5.4

Test summary

Date of calibration: 19 January 2024
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDDQ6R6309
Attenuator	Cirrus Research	ZE:952	93892
Environmental Monitor	Cornet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	40088

Notes

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CERTIFICATE OF CALIBRATION

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 100.90 kPa Temperature: 21.3 °C Humidity: 31.5 %
After Pressure: 100.91 kPa Temperature: 21.5 °C Humidity: 32.6 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

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NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB0954

CERTIFICATE OF CALIBRATION

ISSUED BY

Cirrus Research plc

DATE OF ISSUE

19 January 2024

CERTIFICATE NUMBER

206864

Cirrus Research plc

Acoustic House

Bridlington Road

Hunmanby

North Yorkshire

YO14 0PH

United Kingdom

Page 1 of 2

Approved signatory

N Smith

Electronically signed:



Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer:

Cirrus Research plc

Model:

CR-110A

Serial number:

CB0954

Firmware version:

5.4

Notes:

Eastern Thai Consulting 1992 Co.,Ltd.
683 Moo.11, Sukaphibai 8 Rd., Nongkham,
Sriracha, Chonburi 20230

Test summary

Date of calibration:

19 January 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY56001553
Attenuator	Cirrus Research	ZE-952	78713
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC-110A	100498

Notes

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CERTIFICATE OF CALIBRATION

Certificate Number:

206864

Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before

Pressure: 100.03 kPa

Temperature: 21.9 °C

Humidity: 34.8 %

After

Pressure: 100.06 kPa

Temperature: 21.7 °C

Humidity: 36.8 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

COPY

NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB1498

CERTIFICATE OF CALIBRATION

ISSUED BY

Cirrus Research plc

DATE OF ISSUE

19 January 2024

CERTIFICATE NUMBER

206877

CERTIFICATE OF CALIBRATION

Certificate Number:

206877

Page

2 of 2

Cirrus Research plc

Acoustic House

Bridlington Road

Hummanby

North Yorkshire

YO14 0PH


United Kingdom

Page 1 of 2

Approved signatory

N Smith

Electronically signed:



Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer:

Cirrus Research plc

Model:

CR-110A

Serial number:

CB1498

Firmware version:

5.4

Notes:

Eastern Thai Consulting 1992 Co.,Ltd.
683 Moo.11, Sukaphitai 8 Rd., Nongkham,
Sriacha, Chonburi 20230

Test summary

Date of calibration:

19 January 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE-952	78713
Environmental Monitor	Cornel	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC-110A	100498

Notes

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Environmental conditions

The following conditions were recorded at the time of the test:

Before

Pressure: 100.96 kPa

Temperature: 21,6 °C

Humidity: 33.2 %

After

Pressure: 100.97 kPa

Temperature: 21,5 °C

Humidity: 33.4 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

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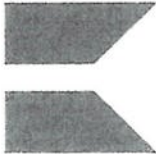
NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB0957

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 19 January 2024 CERTIFICATE NUMBER 206874



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory
N Smith
Electronically signed:

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc Notes: Eastern Thai Consulting 1992 Co.Ltd.
Model: CR-110A 683 Moo.11, Sukaphibai 8 Rd., Nongkham,
Serial number: CB0957 Sriracha, Chonburi 20230
Firmware version: 5.4

Test summary

Date of calibration: 19 January 2024
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE-952	78713
Environmental Monitor	Comet	T7510	15966334
doseBadge Reader	Cirrus Research plc	RC-110A	100498

Notes

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COPY

CERTIFICATE OF CALIBRATION

Certificate Number:
206874
Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 100.86 kPa Temperature: 20.9 °C Humidity: 28.6 %
After Pressure: 100.89 kPa Temperature: 20.7 °C Humidity: 29.0 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

COPY

NOISE DOSI METER

MODEL : NP-DLX

SERIAL No. : NXQ070008

Certificate of Calibration

Customer

Name Eastern Thai Consulting 1992 Co., Ltd.
Address 683 Moo 11, Sukhapibam 8 Rd., Nongkham, Sriracha, Chonburi 20230

Certificate No : 23-NDM-203
Request No : Req-2023-1634

Unit Under Calibration Details

Measurement item : Noise Dosimeter
Manufacturer : 3M
Model : NP-DLX
Serial Number : NXQ070008
ID : -
Resolution : 0.1 dB
Calibration Environment and Details
Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 7 August 2023
Calibrated Date : 16 August 2023
Calibration Procedure : In-house method CP-NDM-01 based on IEC 61252 : 2017
Location of Calibration : Lab Acoustic

Microphone Class : 2
Microphone Model : -
Microphones SN : -
Preamplifier Model : -
Preamplifier SN : -
Instrument Status : Used

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Multifrequency Calibrator	Quest	Quest-cal	188272	25 July 2024	TSI
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Sine Generator	Svantek	Svan401	131	12 October 2023	WK Electric
Timer	EXTECH		05-ACT	20 March 2024	TPA

Note

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

Calibrated By :

Mr. Noppadon Luangart
Calibration Officer

Approved By :

Mr. Paet Mahavorn
Calibration Engineer Supervisor
Issue Date : 16 August 2023

1. Absolute acoustical sensitivity

UUC Setting	Time		Exposure Measurement			Tolerances Limit (%)
	Ref (s)	UUC (s)	Ref (Pa ² h)	UUC (Pa ² h)	Error (%)	
FAST / A / 70-140	120	120	3.79	3.72	-1.85	3.1
Calibrator Setting						
1000 Hz 114 dB						-21, +26

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

2. Frequency weightings

UUC Setting	Deviation from various Frequency Weighting			UNCERTAINTY (± dB)	Tolerances Limit (± dB)
	A (dB)	C (dB)			
FAST / 70-140					
STD Setting	0.4	0.5		0.40	2.0
°63 Hz	-0.1	0.1		0.40	1.5
125 Hz	-0.2	0.0		0.40	1.5
250 Hz	0.0	0.0		0.40	1.5
500 Hz	0.0	0.0		0.40	1.5
1000 Hz	0.1	0.1		0.40	2.0
2000 Hz	0.9	0.9		0.40	3.0
4000 Hz	-1.1	-1.2		0.40	5.0
8000 Hz					

Certificate No 23-NDM-203
Request No Req-2023-1634

3. Linearity of response to steady signals

a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

UUC Setting		FAST / A / High											
1000 Hz	Ref	(dB)	70.0	80.0	90.0	100.0	110.0	114.0	120.0	130.0	140.0		
	Level A	(dB)	70.0	80.3	90.0	99.9	109.9	114.0	120.1	130.3	140.6		
	Error	(dB)	0.0	0.3	0.0	-0.1	-0.1	0.0	0.1	0.3	0.6		
8000 Hz	Ref	(dB)			88.9	98.9	108.9	112.9	118.9	128.9	138.9		
	Level A	(dB)			88.9	99.0	108.9	112.9	118.8	128.5	139.0		
	Error	(dB)			0.0	0.1	0.0	0.0	-0.1	0.0	0.1		
63 Hz	Ref	(dB)						87.8	93.8	103.8	113.8		
	Level A	(dB)						87.8	93.8	103.8	113.9		
	Error	(dB)							0.0	0.0	0.0	0.1	
Tolerances Limit		(±dB)	1.0										
UNCERTAINTY		(±dB)	0.3										

b. Sound exposure meter linearity of error

UUC Setting		Time			Exposure Measurement			Tolerances	
		Ref	UUC	(s)	Ref	UUC	Error		
FAST / A / 70-140		(s)	(s)	(s)	(Pa ² h)	(Pa ² h)	(%)		
Calibrator Setting									
1000 Hz 110 dB		27	27	27	0.30	0.30	0.00	5.6	
1000 Hz 110 dB		45	45	45	0.50	0.50	0.00		
1000 Hz 110 dB		90	90	90	1.00	0.99	-1.00		
1000 Hz 110 dB		180	180	180	2.00	1.99	-0.50		
1000 Hz 120 dB		36	36	36	4.00	4.01	+0.25	-21, +26	
1000 Hz 120 dB		72	72	72	8.00	8.01	+0.12		
1000 Hz 120 dB		90	90	90	10.00	10.02	+0.20		
1000 Hz 120 dB		180	180	180	20.00	20.06	+0.30		
1000 Hz 120 dB		360	360	360	40.00	40.21	+0.53	5.6	
1000 Hz 120 dB		720	720	720	80.00	80.48	+0.60		

Certificate No 23-NDM-203
Request No Req-2023-1634

4. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Setting		Time		Exposure Measurement			Tolerances	
		Ref	UUC	Ref	UUC	Error		
FAST / A / 70-140		(s)	(s)	(Pa ² h)	(Pa ² h)	(Pa ² h)		
Calibrator Setting								
4000 Hz 95 dB		2346	2846	1.00	0.99	-0.01	0.052	-0.29 - +0.41

b. Sound exposure meter response for series of toneburst impulses

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances
		Ref	UUC	Ref	UUC	Error	(%)	Limit
		(s)	(s)	(Pa ² h)	(Pa ² h)	(%)		(%)
FAST / A / 70-140								
Calibrator Setting								
Burst 1 ms, 95 dB		2846	2846	1.00	0.99	-1.00	5.6	-21 - +26
Burst 1 ms, 100 dB		900	900	1.00	0.99	-1.00		
Burst 1 ms, 108 dB		143	143	1.00	1.00	0.00		
								-29 - +41

5. Response to unipolar pulse

UUC Setting		Time		Exposure Measurement			Tolerances	
		Ref	UUC	Ref	UUC	Different		
FAST / A / 70-140		(s)	(s)	(Pa ² h)	(Pa ² h)	(%)		
Calibrator Setting								
Continuous Rectangle 1		29			10.21	+1.86	-21 - +26	
Continuous Rectangle 2					10.02			

* Indicates non accredited

End of Certificate

COPY

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NOISE DOSI METER

MODEL : NP-DLX

SERIAL No. : NXQ070007

Certificate of Calibration

Customer : Eastern Thai Consulting 1992 Co., Ltd
Name :
Address : 683 Moo 11, Sukhaphim 8 Rd., Nongtham, Sriracha, Chonburi 20230
Certificate No : 24-NDM-050
Request No : Req-2024-0279

Unit Under Calibration Details

Measurement item : Noise Dosimeter
Manufacturer : 3M
Model : NP-DLX
Serial Number : NXQ070007
ID : -
Resolution : 0.1 dB
Instrument Status : Used

Calibration Environment and Details


Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 5 February 2024
Calibrated Date : 6 March 2024
Calibration Procedure : In-house method CP-NDM-01 based on IEC 61252 : 2017
Location of Calibration : Lab Acoustic


Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Multifrequency Calibrator	Quest	Quest-cal	EFA000734	25 July 2024	ISI
Standard Microphone	GRAS	40AN	188273	21 August 2024	GRAS
Sine Generator	SvanteK	Svan401	131	9 October 2024	WK Electric
Timer	EXTECH	-	05-ACT	21 March 2024	TPA

Note

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

Calibrated By : 
Mr. Noppadon Luangant
Service Calibration Engineer

Approved By : 
Mr. Pacit Mahavorn
Calibration Engineer Supervisor
Issue Date : 6 March 2024



1. Absolute acoustical sensitivity

LUC Setting	Time		Exposure Measurement			Tolerances Limit (%)
	Ref (s)	U/C (s)	Ref (Pa ² h)	LUC (Pa ² h)	Error (%)	
FAST / A / 70-140	120	120	3.79	3.72	-1.8	3.1
Calibrator Setting						
1000 Hz 114 dB						-21, +26

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

2. Frequency weightings

LUC Setting	Deviation from various Frequency Weighting			UNCERTAINTY (± dB)	Tolerances Limit (± dB)
	A (dB)	C (dB)			
FAST / 70-140					
STD Setting					
40 Hz	0.3	0.6		0.40	2.0
125 Hz	0.4	0.7		0.40	1.5
250 Hz	0.4	0.5		0.40	1.5
500 Hz	0.4	0.5		0.40	1.5
1000 Hz	0.0	0.0		0.40	-
2000 Hz	-1.1	-1.1		0.40	2.0
4000 Hz	-1.3	-1.3		0.40	3.0
8000 Hz	-1.8	-1.8		0.40	5.0

Certificate No: 24-NDM-050

Request No: Req-2024-0279

4. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Setting	Time		Exposure Measurement			Tolerances Limit (Pa ² h)
	Ref (s)	UUC (s)	Ref (Pa ² h)	UUC (Pa ² h)	Error (Pa ² h)	
FAST / A / 70-140						
Calibrator Setting						
4000 Hz 95 dB	2846	2846	1.00	0.99	-0.01	0.032
						-0.29 - +0.41

b. Sound exposure meter response for series of toneburst impulses

UUC Setting	Time		Exposure Measurement			Tolerances Limit (%)
	Ref (s)	UUC (s)	Ref (Pa ² h)	UUC (Pa ² h)	Error (%)	
FAST / A / 70-140						
Calibrator Setting						
Burst 1 ms, 95 dB	2846	2846	1.00	0.99	-1.00	-21 - +26
Burst 1 ms, 100 dB	900	900	1.00	0.99	-1.00	-29 - +41
Burst 1 ms, 108 dB	143	143	1.00	1.00	0.00	-29 - +41

5. Response to unipolar pulse

UUC Setting	Time		Exposure Measurement			Tolerances Limit (%)
	Ref (s)	UUC (s)	Ref (Pa ² h)	UUC (Pa ² h)	Different (%)	
FAST / A / 70-140						
Calibrator Setting						
Continuous Rectangle -						
Continuous Rectangle	29			10.26	11.66	-21 - +26
				10.09		

* Indicates non accredited

End of Certificate

COPY

Certificate No: 24-NDM-050

Request No: Req-2024-0279

3. Linearity of response to steady signals

a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

UUC Setting	FAST / A / High									
	Ref (dB)	55.0	80.0	90.0	100.3	110.0	114.0	120.0	130.0	138.0
1000 Hz	Level A (dB)	70.2	80.1	90.0	100.0	110.0	114.0	120.0	130.0	140.1
	Error (dB)	15.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	2.1
	Ref (dB)				88.9	98.9	108.9	112.9	118.9	128.9
8000 Hz	Level A (dB)				89.0	99.0	108.8	112.9	118.8	128.7
	Error (dB)				0.1	0.1	-0.1	0.0	-0.1	1.8
	Ref (dB)							87.8	93.8	103.8
63 Hz	Level A (dB)							87.8	93.8	103.8
	Error (dB)							0.0	0.0	2.0
	Tolerances Limit (±dB)							1.0		
UNCERTAINTY (±dB)								0.3		

b. Sound exposure meter linearity of error

UUC Setting	Time		Exposure Measurement			Tolerances Limit (%)
	Ref (s)	UUC (s)	Ref (Pa ² h)	UUC (Pa ² h)	Error (%)	
FAST / A / 70-140						
Calibrator Setting						
1000 Hz 110 dB	27	27	0.30	0.30	0.00	
1000 Hz 110 dB	45	45	0.50	0.50	0.00	
1000 Hz 110 dB	90	90	1.00	0.99	-1.00	
1000 Hz 110 dB	180	180	2.00	1.98	-1.00	
1000 Hz 120 dB	36	36	4.00	3.99	-0.25	
1000 Hz 120 dB	72	72	8.00	7.98	-0.25	
1000 Hz 120 dB	90	90	10.00	9.98	-0.20	
1000 Hz 120 dB	180	180	20.00	19.95	-0.25	
1000 Hz 120 dB	360	360	40.00	39.91	-0.23	
1000 Hz 120 dB	720	720	80.00	79.82	-0.23	
						-21, +26
						5.6
						5.6

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NOISE DOSI METER

MODEL : NP-DLX

SERIAL No. : NXL060046

Certificate of Calibration

Customer

Name : Eastern Thai Consulting 1992 Co., Ltd.

Address : 683 Moo 11, Sukhaphitum 8 Rd., Nongkham, Sriracha, Chonburi 20230

Certificate No : 24-NDM-090

Request No : Req-2024-0708

Unit Under Calibration Details

Measurement item : Noise Dosimeter

Manufacturer : 3M

Model : NP-DLX

Serial Number : NXL060046

ID : -

Resolution : 0.1 dB

Microphone Class : 2

Microphone Model : -

Microphone S/N : -

Preamplifier Model : -

Preamplifier S/N : -

Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C

Humidity : 50 %RH ± 20 %RH

Barometric Pressure : 1013 hPa ± 10 hPa

Received Date : 28 March 2024

Calibrated Date : 3 April 2024


Calibration Procedure : In-house method C1-NDM-01 based on IEC 61252 : 2017

Location of Calibration : Lab Acoustic

Reference Standard			
Instrument	Brand	Model	SN.
Multifrequency Calibrator	Quest	Quest-cal	EFA000234
Standard Microphone	GRAS	40AN	188273
Sine Generator	Svantek	Svan401	131
Timer	EXTECH	-	05-ACT


Note

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

Calibrated By : 

Mr. Noppadon Luangart

Service Calibration Engineer

Approved By : 

Mr. Pacit Mahavom

Calibration Engineer Supervisor

Issue Date : 3 April 2024

1. Absolute acoustical sensitivity		Exposure Measurement				UNCERTAINTY	Tolerances
UUC Setting		Time		Ref		UUC	Error
FAST / 70-140		Ref		UUC		Ref	UUC
Calibrator Setting		(s)		(s)		(Pa ² h)	(Pa ² h)
1000 Hz 114 dB		120		120		3.79	3.72
							-1.8
							3.1
							-2.1, +2.6

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

2. Frequency weightings		Deviation from various				UNCERTAINTY	Tolerances
UUC Setting		Frequency Weighting		Ref		UUC	Error
FAST / 70-140		A		C		Ref	UUC
STD Setting		(dB)		(dB)		(Pa ² h)	(Pa ² h)
*63 Hz		0.4		0.7		0.40	2.0
125 Hz		0.6		0.9		0.40	1.5
250 Hz		0.5		0.7		0.40	1.5
500 Hz		0.5		0.6		0.40	1.5
1000 Hz		0.0		0.0		0.40	*
2000 Hz		-1.0		-1.0		0.40	2.0
4000 Hz		-1.6		-1.6		0.40	3.0
8000 Hz		2.7		2.7		0.40	5.0

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Certificate No : 24-NDM-090

Request No : Req-2024-0708

4. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Setting	Time		Exposure Measurement			Tolerances Limit
	Ref	UUC	Ref	UUC	Error	
FAST / A / 70-140	(s)	(s)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)
Calibrator Setting						
4000 Hz 95 dB	2846	2846	1.00	0.99	-0.01	0.052

b. Sound exposure meter response for series of toneburst impulses

UUC Setting	Time		Exposure Measurement			Tolerances Limit
	Ref	UUC	Ref	UUC	Error	
FAST / A / 70-140	(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)
Calibrator Setting						
Burst 1 ms, 95 dB	2846	2846	1.00	0.99	-1.00	-21 - +26
Burst 1 ms, 100 dB	900	900	1.00	0.99	-1.00	-29 - +41
Burst 1 ms, 108 dB	143	143	1.00	1.00	0.00	-29 - +41

5. Response to unipolar pulse

UUC Setting	Time		Exposure Measurement			Tolerances Limit
	Ref	UUC	Ref	UUC	Different	
FAST / A / 70-140	(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)
Calibrator Setting						
Continuous Rectangle +	29	29	10.04	10.01	+0.30	-21 - +26
Continuous Rectangle -						

* Indicates non accredited

End of Certificate



Certificate No : 24-NDM-090

Request No : Req-2024-0708

3. Linearity of response to steady signals

a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

UUC Setting	FAST / A / High											
	Ref	(dB)	70.0	80.0	90.0	100.0	110.0	114.0	120.0	130.0	140.0	
1000 Hz	Level A	(dB)	70.4	80.1	90.0	100.0	110.0	114.0	120.0	130.0	140.1	
	Error	(dB)	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	Ref	(dB)			88.9	98.9	108.9	112.9	118.9	128.9	138.9	
8000 Hz	Level A	(dB)			89.0	99.0	108.9	112.9	118.8	128.8	138.9	
	Error	(dB)			0.1	0.1	0.0	0.0	-0.1	-0.1	0.0	0.0
	Ref	(dB)						87.8	93.8	103.8	113.8	
63 Hz	Level A	(dB)						87.8	93.7	103.8	113.8	
	Error	(dB)						0.0	-0.1	0.0	0.0	0.0
	Tolerances Limit	(±dB)						1.0				
UNCERTAINTY		(±dB)						0.3				

b. Sound exposure meter linearity of error

UUC Setting	Time		Exposure Measurement			Tolerances Limit
	Ref	UUC	Ref	UUC	Error	
FAST / A / 70-140	(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)
Calibrator Setting						
1000 Hz 110 dB	27	27	0.30	0.30	0.00	
1000 Hz 110 dB	45	45	0.50	0.50	0.00	
1000 Hz 110 dB	90	90	1.00	0.99	-1.00	
1000 Hz 110 dB	180	180	2.00	1.99	-0.50	
1000 Hz 120 dB	36	36	4.00	4.00	0.00	
1000 Hz 120 dB	72	72	8.00	7.99	-0.13	
1000 Hz 120 dB	90	90	10.00	9.99	-0.10	
1000 Hz 120 dB	180	180	20.00	19.97	-0.15	
1000 Hz 120 dB	360	360	40.00	39.94	-0.15	
1000 Hz 120 dB	720	720	80.00	79.89	-0.14	



NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB0954

CERTIFICATE OF CALIBRATION

ISSUED BY

Cirrus Research plc

DATE OF ISSUE

19 January 2024

CERTIFICATE NUMBER

206864



Cirrus Research plc

Acoustic House

Bridlington Road

Hunmanby

North Yorkshire

YO14 0PH

United Kingdom

Page 1 of 2

Approved signatory

N Smith

Electronically signed:



Dosimeter : IEC 61252-1993+A1:2000

Instrument information			Notes:
Manufacturer:	Cirrus Research plc	CR:110A	Eastern Thai Consulting 1992 Co.,Ltd.
Serial number:	CB0954		683 Moo.11, Sukaphitbai 8 Rd., Nongkham,
Firmware version:	5.4		Sriracha, Chonburi 20230

Test summary

Date of calibration: 19 January 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment			
Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE-952	78713
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	100498

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

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CERTIFICATE OF CALIBRATION

Environmental conditions

The following conditions were recorded at the time of the test:

Before	Pressure: 100.03 kPa	Temperature: 21.9 °C	Humidity: 34.8 %
After	Pressure: 100.06 kPa	Temperature: 21.7 °C	Humidity: 36.8 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

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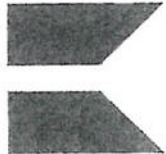
NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB0956

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 19 January 2024 CERTIFICATE NUMBER 206875



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2

Approved signatory
N.Smith
Electronically signed:

Dosemeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc Notes: Eastern Thai Consulting 1992 Co.,Ltd.
Model: CR:110A 683 Moo.11, Sukaphibai 8 Rd., Nongkhham,
Serial number: CB0956 Sriracha, Chonburi 20230
Firmware version: 5.4

Test summary

Date of calibration: 19 January 2024
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDDQ6R6309
Attenuator	Cirrus Research	ZE:952	93892
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	40088

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 100.92 kPa Temperature: 21.7 °C Humidity: 36.0 %
After Pressure: 100.93 kPa Temperature: 21.5 °C Humidity: 35.9 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

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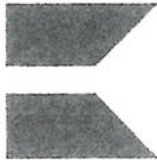
NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB1500

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 19 January 2024 CERTIFICATE NUMBER 206866



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

Page 1 of 2
Approved signatory
N Smith
Electronically signed:

N. Smith

Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc Notes: Eastern Thai Consulting 1992 Co.,Ltd.
Model: CR:110A 683 Moo.11, Sukaphibai 8 Rd., Nongkham,
Serial number: CB1500 Sriracha, Chonburi 20230
Firmware version: 5.4

Test summary

Date of calibration: 19 January 2024
The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.
The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	SIGLENT	SDG1032X	SDG1XDDQ6R6309
Attenuator	Cirrus Research	ZE:952	93892
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	40088

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:
206866
Page 2 of 2

Environmental conditions

The following conditions were recorded at the time of the test:

Before Pressure: 100.96 kPa Temperature: 21.6 °C Humidity: 34.1 %
After Pressure: 100.95 kPa Temperature: 21.6 °C Humidity: 34.7 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

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NOISE DOSI METER

MODEL : CR:110A

SERIAL No. : CB1498

CERTIFICATE OF CALIBRATION

ISSUED BY
Cirrus Research plc

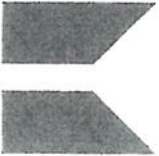
DATE OF ISSUE
19 January 2024

CERTIFICATE NUMBER
206877

CERTIFICATE OF CALIBRATION

Certificate Number:
206877

Page 2 of 2



Cirrus Research plc

Acoustic House

Bridlington Road

Hunmanby


North Yorkshire

YO14 0PH

United Kingdom

Page 1 of 2

Approved signatory
N. Smith

Electronically signed:


Dosimeter : IEC 61252-1993+A1:2000

Instrument information

Manufacturer: Cirrus Research plc

Model: CR:110A

Serial number: CB1498

Firmware version: 5.4

Notes:

Eastern Thai Consulting 1992 Co.,Ltd.

883 Moo.11, Sukaphibai 8 Rd., Nongkham,

Sitachai, Chonburi 20230

Test summary

Date of calibration: 19 January 2024

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	KEYSIGHT	33511B	MY58001553
Attenuator	Cirrus Research	ZE:952	78713
Environmental Monitor	Comet	T7510	16966334
doseBadge Reader	Cirrus Research plc	RC:110A	100498

Notes

The certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%.

Environmental conditions

The following conditions were recorded at the time of the test:

Before	Pressure: 100.96 kPa	Temperature: 21.6 °C	Humidity: 33.2 %
After	Pressure: 100.97 kPa	Temperature: 21.5 °C	Humidity: 33.4 %

Test results summary

Test	Result
Linearity	Complies
Short Duration	Complies
Overload Latching	Complies
Frequency weighting	Complies
Absolute Acoustic Sensitivity	Complies

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ภาคผนวก ง : หนังสืออนุญาตขึ้นทะเบียน
ห้องปฏิบัติการวิเคราะห์เอกชน



ที่ อก ๐๓๒๐/๑๓๓๒๑

๒๗ กรกฎาคม ๒๕๖๖

เรื่อง ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

เรียน กรรมการผู้จัดการ บริษัท อีสเทิร์น ไทย คอนซิลต์ติ้ง ๑๙๙๒ จำกัด

อ้างถึง คำขอต่ออายุของห้องปฏิบัติการวิเคราะห์เอกชน ลงวันที่ ๗ มิถุนายน ๒๕๖๖

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน

๑. รายชื่อผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย

๒. รายชื่อเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒๔ ราย

๓. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๕๒ รายการ จำนวน ๑๙ แผ่น

ตามหนังสือที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซิลต์ติ้ง ๑๙๙๒ จำกัด ขอต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน เลขทะเบียน ๖-๐๐๓ สถานที่ตั้งเลขที่ ๖๘๓ หมู่ที่ ๑๑ ถนนสุขุมวิท ๘๘ ตำบลหนองแขม อำเภอศรีราชา จังหวัดชลบุรี ต่อกรมโรงงานอุตสาหกรรม นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว ให้บริษัท อีสเทิร์น ไทย คอนซิลต์ติ้ง ๑๙๙๒ จำกัด ต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน โดยมีองค์ประกอบดังนี้

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย ตามสิ่งที่ส่งมาด้วย ๑
ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒๔ ราย ตามสิ่งที่ส่งมาด้วย ๒
ค. ขอบข่ายสารเคมีที่ได้รับขึ้นทะเบียนให้วิเคราะห์ในน้ำเสีย จำนวน ๔๗ รายการ (ปลอรรถบาย) จำนวน ๒๑ รายการ น้ำได้ดื่ม จำนวน ๑๑๑ รายการ สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน ๑๘ รายการ และดิน จำนวน ๙๔ รายการ รวมทั้งสิ้นจำนวน ๒๕๒ รายการ ตามสิ่งที่ส่งมาด้วย ๓

หนังสือฉบับนี้จะหมดอายุในวันที่ ๔ กรกฎาคม ๒๕๖๙ หากประสงค์จะต่ออายุหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ให้ยื่นคำขอต่ออายุพร้อมเอกสารประกอบคำขอต่อกรมโรงงานอุตสาหกรรม ภายใน ๓๐ วัน ก่อนวันสิ้นสุดของหนังสือรับขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน ทั้งนี้ สามารถยื่นคำขอผ่านระบบอิเล็กทรอนิกส์ได้ที่หน้าเว็บไซต์กรมโรงงานอุตสาหกรรม

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายทวี อำพาพันธ์)

ผู้อำนวยการศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก
ปฏิบัติราชการแทนอธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก
โทร. ๐ ๓๓๑๓ ๖๐๕๔ ต่อ ๕๐๐๑-๒

ไปรษณีย์อิเล็กทรอนิกส์ einw@dw.mail.go.th

"อุตสาหกรรมที่ปลอดภัย ร่วมกันพัฒนา ยุทธศาสตร์สีเขียว"



เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกชน
บริษัท อีสเทิร์น ไทย คอนซิลต์ติ้ง ๑๙๙๒ จำกัด เลขทะเบียน ๖-๐๐๓
ที่ อก ๐๓๒๐/๑๓๓๒๑ ลงวันที่ ๒๗ กรกฎาคม ๒๕๖๖

ก. ผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๔๐ ราย

๑) นางสาวมาลีเกษ เละระวิกุล	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๑
๒) นายวัฒนา โคตรหล้า	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๒
๓) นางวรรณเพ็ญ เหล่าจินดาวัฒน์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๓
๔) นายกะวีร์ สุราษฎร์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๔
๕) นางสาวนันท์ณัฏฐ์ แบลนด์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๕
๖) นางสาวพรนภา หลงคำหงษ์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๖
๗) นางสาวกรรติ ชื่นอารมย์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๗
๘) นางสาวอังธร จิตตะยโสธร	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๘
๙) นางสาวจิราพร ปานคง	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๐๙
๑๐) นายสุทธา สองงนินัย	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๐
๑๑) นางสาวนันท์ประภา อยู่สูงเนิน	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๑
๑๒) นายธงชัย บุญศักดิ์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๒
๑๓) นางสาวธนาพร กลิ่นโสภณ	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๓
๑๔) นายธีระพงษ์ นวลอินทร์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๔
๑๕) นางสาวแพรว พลเสน	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๕
๑๖) นายทรงพล ผิวอ่อน	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๖
๑๗) นายภาคภูมิ บัวสวัสดิ์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๗
๑๘) นางสาวจันทน์ สายพันธ์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๘
๑๙) นายภาณุพงศ์ บำรุงส	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๑๙
๒๐) นางสาวภาณิน จันดีสอน	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๐
๒๑) นายวรการ ไวยะเสวี	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๑
๒๒) นางสาววรรณภา ไชยศิริ	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๒
๒๓) นางสาวพรพิมล ภูมิคอนสาร	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๓
๒๔) นางสาวธมลวรรณ ผลอ้อ	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๔
๒๕) นางสาวบุญเรือง บุญถม	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๕
๒๖) นางสาวกัลลีนท์ ป้อมน้อย	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๖
๒๗) นายชานันต์ ใจตะวงศ์	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๗
๒๘) นางสาวพนัญญ์ งามวิสัย	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๘
๒๙) นายวิญญ์วัณ ลิขิต	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๒๙
๓๐) นางสาวนุฏฐิ อารศรี	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๓๐
๓๑) นายศุภฤกษ์ พาดกลาง	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๓๑
๓๒) นายณิชาพล ทองหล่อ	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๓๒
๓๓) นายธรรมรัตน์ โพธิ์ตันคำ	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๓๓
๓๔) นายโอชา ขวัญศิริมงคล	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๓๔
๓๕) นายเมธี สุประเสริฐ	ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๓๕

๓๖) นางสาวพรพินท์...

- ๓๖) นางสาวพรพินันท์ วิทยาลัยกุล
๓๗) นางสาวอภากาณีย์ เสริมสนธิ
๓๘) นางสาวณภัทรธรมณ์ ประดิษฐ์
๓๙) นางสาวสุนิษา เอ็งแสง
๔๐) นางสาวระพีณ อินัน
- ข. เจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๒๕ ราย
- ๑) นางสาวดวงกมล เนื้อทอง
๒) นางสาววัชรารักษ์ อินทสุข
๓) นางสาวกัญญ์ณัฏฐา จันทรรอดแก้ว
๔) นางสาวฉัตรสุดา มงคลโนนชัย
๕) นางสาวณัฐวดี อัมมัททัศน์
๖) นางสาวนิอรธมา ปาระ
๗) นางสาวณัฐลักษณ์ ชื่นไต่
๘) นางสาวสุทธิดา สร้างแก้ว
๙) นายอุดมทรัพย์ เถนเจริญ
๑๐) นายณิธิพงษ์ สงวนศิลป์
๑๑) นายวีระชัย พอใจ
๑๒) นายอัยยสิทธิ์ ทะพงษ์
๑๓) นางสาวสุเมธิตรา มีแก่น
๑๔) นางสาวสุรยา เพชรประไพ
๑๕) นางสาวจุฑามาศ เจริญพรหม
๑๖) นางสาวนิภาพร คำมฤ
๑๗) นางสาวอรุษา พันธุ์เมือง
๑๘) นายกิตติ ไพบูลย์
๑๙) นายชญาณรงค์ ดั่งธรรมรักษ์
๒๐) นางสาวปวีณา เอี่ยมะ
๒๑) นางสาวสุภาวดี กิจดี
๒๒) นางสาวสุภาวดี ศรีทอง
๒๓) นางสาวณัฐยา บรรพบุตร
๒๔) นางสาวณัฐนิช นนดานอก
๒๕) นางสาวดวงสุดา แสนวันดี
- ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๓๖
ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๓๗
ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๓๘
ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๓๙
ทะเบียนเลขที่ ๖-๐๐๓-ค-๐๐๔๐
- ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๐๑
ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๐๒
ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๐๓
ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๐๔
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ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๑๐
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ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๑๒
ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๑๓
ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๑๔
ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๑๕
ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๑๖
ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๑๗
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ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๒๑
ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๒๒
ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๒๓
ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๒๔
ทะเบียนเลขที่ ๖-๐๐๓-จ-๐๐๒๕

เอกสารแนบท้ายหนังสือรับต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์
บริษัท อีสเทิร์น ไทย คอนซัลติง ๑๙๙๒ จำกัด เลขทะเบียน ๖-๐๐๓
ที่ อก ๐๓๒๐/๑๑๓๔๒ ลงวันที่ ๒๗ กรกฎาคม ๒๕๖๖

ขอช่วยสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๒๕๒ รายการ

แนบรายชื่อ จำนวน 47 รายการ

ลำดับที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
2	Arsenic	1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾ Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
3	Barium	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
4	α-BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
5	β-BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
6	δ-BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
7	γ-BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method ⁽⁴⁾ 2) 5-Day BOD Test, Azide Modification Method ⁽⁴⁾ Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
9	Cadmium	Closed Reflux, Titrimetric Method ⁽⁴⁾
10	Chemical Oxygen Demand	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
11	cis-Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
12	trans-Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
13	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

ลำดับที่	สารเคมี	วิธีวิเคราะห์
14	Color	ADMI Weighted-Ordinate Spectrophotometric Method ⁽⁴⁾
15	Copper	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
16	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
17	4,4'-DDD	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
18	4,4'-DDE	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
19	DDT	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
20	Dieldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
21	Endosulfan I	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
22	Endosulfan II	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
23	Endosulfan sulfate	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
24	Endrin	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
25	Endrin aldehyde	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
26	Endrin ketone	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
27	Formaldehyde	Distillation, Colorimetric Method ⁽³⁾
28	Free Chlorine	1) Iodometric Method ⁽⁴⁾ 2) Colorimetric Method ⁽⁴⁾

29 Heptachlor...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
29	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
30	Heptachlor Epoxide	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
31	Hexavalent Chromium	Filtration, Colorimetric Method ⁽⁴⁾
32	Lead	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
33	Manganese	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
34	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾
35	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽⁴⁾
36	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
37	Oil and Grease	Liquid-Liquid, Partition-Gravimetric Method ⁽⁴⁾
38	pH	Electrometric Method ⁽⁴⁾
39	Phenols	Distillation, Direct Photometric Method ⁽⁴⁾
40	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾
41	Sulfide	ZnS Precipitation, Iodometric Method ⁽⁴⁾
42	Temperature	Field Method ⁽⁴⁾
43	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Filtration, Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽⁴⁾
44	Total Dissolved Solids	Dried at 180 °C ⁽⁴⁾
45	Total Kjeldahl Nitrogen	Macro Kjeldahl Method ⁽⁴⁾
46	Total Suspended Solids	Dried at 103-105 °C ⁽⁴⁾
47	Zinc	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

อากาศเสีย...

อากาศเสีย (ปล่อยระบาย) จำนวน 21 รายการ

ลำดับที่	สารมลพิษ	วิธีการหา
1	Antimony	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
2	Arsenic	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
3	Cadmium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
4	Carbon Monoxide	1) Bag, Non-Dispersive Infrared Method ^[5] 2) Instrumental Analyzer Method ^[5]
5	Chromium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
6	Cobalt	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
7	Copper	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
8	Hydrogen Sulfide	Absorption Sampling, Iodometric Method ^[5]
9	Lead	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
10	Manganese	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
11	Mercury	Isokinetic Sampling, Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[5]
12	Nickel	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
13	Opacity	Ringelmann's Method ^[1,5]
14	Oxides of Nitrogen	1) Absorption Sampling, Phenoldisulfonic Acid Method ^[6] 2) Instrumental Analyzer Method ^[7]
15	Selenium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
16	Sulfur Dioxide	1) Absorption Sampling, Barium-Thorin Titrimetric Method ^[5] 2) Instrumental Analyzer Method ^[5]
17	Sulfuric Acid	Isokinetic Sampling, Barium-Thorin Titrimetric Method ^[6]
18	Tin	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]

19 Total Suspended Particulate...

ลำดับที่	สารมลพิษ	วิธีการหา
19	Total Suspended Particulate	Isokinetic Sampling, Gravimetric Method ^[6]
20	Vanadium	Isokinetic Sampling, Digestion, Inductively Coupled Plasma Method ^[5]
21	Xylene	Adsorption Sampling, Gas Chromatographic Method ^[6]

น้ำใต้ดิน จำนวน 111 รายการ

ลำดับที่	สารมลพิษ	วิธีการหา
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
5	Antimony	Digestion, Inductively Coupled Plasma Method ^[4]
6	Arsenic	1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method ^[4] 2) Digestion, Inductively Coupled Plasma Method ^[4]
7	Barium	Digestion, Inductively Coupled Plasma Method ^[4]
8	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
9	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
10	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
11	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
12	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
13	Benzo[g,h,i]perylene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
14	Beryllium	Digestion, Inductively Coupled Plasma Method ^[4]

15 Bis(2-chloroethyl)ether...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
15	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
16	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
17	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
18	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
19	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
20	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
21	Cadmium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
22	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
23	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
24	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
25	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
26	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
27	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
28	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
29	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
30	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
31	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
32	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Filtration, Colorimetric Method; Calculation ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation ⁽⁴⁾

ลำดับที่	สารเคมี	วิธีวิเคราะห์
33	Chromium (VI)	Filtration, Colorimetric Method ⁽⁴⁾
34	Cnrysene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
35	Cyanide	Distillation, Colorimetric Method ⁽⁴⁾
36	DDD	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
37	DDE	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
38	DDT	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
39	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
40	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
41	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
42	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
43	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
44	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
45	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
46	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
47	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
48	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
49	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
50	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
51	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

ลำดับที่	สารเคมี	วิธีวิเคราะห์
52	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
53	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
54	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
55	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
56	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
57	Di-n-octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
58	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
59	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
60	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
61	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
62	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
63	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
64	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
65	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
66	Hexachloro-1,3-butadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
67	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
68	α -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
69	β -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

70 γ -HCH...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
70	γ -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
71	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
72	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
73	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
74	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
75	Lead	1) Digestion, Direct Air-Acetylene Flame Method ⁽⁴⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
76	Manganese	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
77	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽⁴⁾
78	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
79	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
80	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
81	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
82	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
83	Naphthalene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
84	Nickel	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
85	Nitrobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
86	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
87	pH	Electrometric Method ⁽⁴⁾
88	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

89 Phenol...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
89	Phenol	1) Distillation, Direct Photometric Method ⁽⁴⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
90	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
91	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽⁴⁾
92	Silver	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
93	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
94	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
95	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
96	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
97	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
98	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
99	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
100	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
101	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
102	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
103	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
104	Vanadium	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾
105	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
106	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾

107 m-Xylene...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
107	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
108	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
109	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
110	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽⁴⁾
111	Zinc	Digestion, Inductively Coupled Plasma Method ⁽⁴⁾

สิ่งปฏิกูลหรือวัสดุที่ไม่ใช้แล้ว จำนวน 18 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Antimony	Digestion, Inductively Coupled Plasma Method ^(9,10)
2	Arsenic	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,9,10) 2) Digestion, Inductively Coupled Plasma Method ^(9,10)
3	Barium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,9,10) 2) Digestion, Inductively Coupled Plasma Method ^(9,10)
4	Beryllium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,9,10) 2) Digestion, Inductively Coupled Plasma Method ^(9,10)
5	Cadmium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,9,10) 2) Digestion, Inductively Coupled Plasma Method ^(9,10)
6	Chromium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,9,10) 2) Digestion, Inductively Coupled Plasma Method ^(9,10)
7	Chromium (VI)	1) Waste Extraction, Digestion, Colorimetric Method ^(2,13) 2) Alkaline Digestion, Colorimetric Method ^(9,13)
8	Cobalt	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,9,10) 2) Digestion, Inductively Coupled Plasma Method ^(9,10)
9	Copper	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^(2,9,10) 2) Digestion, Inductively Coupled Plasma Method ^(9,10)

ลำดับที่	สารเคมี	วิธีวิเคราะห์
10	Lead	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
11	Mercury	1) Waste Extraction, Digestion, Cold Vapor Atomic Absorption Spectrometric Method ^[2,11] 2) Digestion, Cold vapor Atomic Absorption Spectrometric Method ^[9,11]
12	Nickel	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
13	Molybdenum	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
14	Selenium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
15	Silver	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
16	Thallium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
17	Vanadium	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]
18	Zinc	1) Waste Extraction, Digestion, Inductively Coupled Plasma Method ^[2,9,10] 2) Digestion, Inductively Coupled Plasma Method ^[9,10]

ดิน จำนวน 95 รายการ

ลำดับที่	สารเคมี	วิธีวิเคราะห์
1	Acenaphthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
3	Anthracene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
4	Antimony	Digestion, Inductively Coupled Plasma Method ^[9,10]
5	Arsenic	Digestion, Inductively Coupled Plasma Method ^[9,10]
6	Barium	Digestion, Inductively Coupled Plasma Method ^[9,10]
7	Benz(a)anthracene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
8	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
9	Benzo(b)fluoranthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
10	Benzo(k)fluoranthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
11	Benzo(a)pyrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
12	Benzo(g,h,i)perylene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
13	Beryllium	Digestion, Inductively Coupled Plasma Method ^[9,10]
14	Bis(2-chloroethyl)ether	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
15	Bis(2-ethylhexyl)phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[15,17]
16	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
17	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]
18	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[14,16]

ลำดับที่	สารเคมี	วิธีวิเคราะห์
19	Butyl benzyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
20	Cadmium	Digestion, Inductively Coupled Plasma Method ^(9,10)
21	Carbazole	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
22	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
23	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
24	p-Chloroaniline	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
25	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
26	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
27	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
28	2-Chlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
29	Chromium	Digestion, Inductively Coupled Plasma Method ^(9,10)
30	Chromium (III)	Digestion, Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation ^(9,10)
31	Chromium (VI)	Alkaline Digestion, Colorimetric Method ^(12,13)
32	Chrysene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
33	Dibenz(a,h)anthracene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
34	Di-n-butyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
35	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
36	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
37	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)

38 1,1-Dichloroethane...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
38	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
39	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
40	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
41	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
42	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
43	2,4-Dichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
44	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
45	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
46	Diethyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
47	2,4-Dimethylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
48	2,4-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
49	2,6-Dinitrotoluene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
50	Di-n-octyl phthalate	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
51	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
52	Fluoranthene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
53	Fluorene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
54	Hexachlorobenzene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
55	Hexachloro-1,3-butadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)

56 n-Hexane...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
56	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
57	Hexachlorocyclopentadiene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
58	Hexachloroethane	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
59	Indeno(1,2,3-cd)pyrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
60	Isophorone	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
61	Lead	Digestion, Inductively Coupled Plasma Method ^(9,10)
62	Manganese	Digestion, Inductively Coupled Plasma Method ^(9,10)
63	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^(9,11)
64	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
65	2-Methylphenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
66	2-Methylnaphthalene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
67	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
68	Naphthalene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
69	Nickel	Digestion, Inductively Coupled Plasma Method ^(9,10)
70	Nitrobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
71	N-Nitrosodi-n-propylamine	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
72	Phenanthrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
73	Phenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
74	Pyrene	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)

75 Selenium...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
75	Selenium	Digestion, Inductively Coupled Plasma Method ^(9,10)
76	Silver	Digestion, Inductively Coupled Plasma Method ^(9,10)
77	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
78	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
79	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
80	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
81	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
82	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
83	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
84	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
85	2,4,5-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
86	2,4,6-Trichlorophenol	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^(15,17)
87	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
88	Vanadium	Digestion, Inductively Coupled Plasma Method ^(9,10)
89	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
90	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
91	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
92	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
93	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)

94 Xylene (Total)...

ลำดับที่	สารเคมี	วิธีวิเคราะห์
94	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^(14,16)
95	Zinc	Digestion, Inductively Coupled Plasma Method ^(9,10)

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ที่ อภ ๐๓๒๐/ ๔๖๐๔ / 1

กรมโรงงานอุตสาหกรรม

ถนนพหลโยธิน แขวงทุ่งพญาไท

เขตราชเทวี กรุงเทพฯ ๑๐๔๐๐

๑๔ พฤษภาคม ๒๕๖๗

เรื่อง เปลี่ยนแปลงเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษ เปลี่ยนแปลงสารมลพิษในดิน และเปลี่ยนแปลงบุคลากรของห้องปฏิบัติการวิเคราะห์

เรียน กรรมการผู้จัดการ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๖๒ จำกัด

อ้างถึง คำขอขึ้นทะเบียน/ต่ออายุ/เปลี่ยนแปลงบุคลากร และชนิดสารมลพิษของห้องปฏิบัติการวิเคราะห์เอกสารลงวันที่ ๔ มีนาคม ๒๕๖๗

สิ่งที่ส่งมาด้วย เอกสารแนบท้ายหนังสือเปลี่ยนแปลงเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษ และเปลี่ยนแปลงสารมลพิษบริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๖๒ จำกัด จำนวน ๑๒ แผ่น

ตามคำขอฯ ที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติ้ง ๑๙๖๒ จำกัด ห้องปฏิบัติการวิเคราะห์เอกสาร เลขทะเบียน ๖-๐๐๓ สถานที่ตั้งเลขที่ ๖๘๓ หมู่ที่ ๑๑ ถนนสุขุมวิท ๘ ตำบลหนองแขม อำเภอสัตหีบ จังหวัดชลบุรี แจ้งขอเปลี่ยนแปลงเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษในน้ำเสีย น้ำใต้ดิน เปลี่ยนแปลงสารมลพิษในดิน และเปลี่ยนแปลงบุคลากร นั้น

กรมโรงงานอุตสาหกรรมพิจารณาแล้ว มีความเห็นดังนี้

๑. ให้ยกเลิกผู้ควบคุมดูแลห้องปฏิบัติการวิเคราะห์ จำนวน ๑ ราย
นายวัฒนา โคตรหล้า ทะเบียนเลขที่ ๖-๐๐๓-๓-๐๐๐๒
๒. ให้ยกเลิกเจ้าหน้าที่ประจำห้องปฏิบัติการวิเคราะห์ จำนวน ๓ ราย
 - ๑) นางสาวอัญชลี พะพงษ์ ทะเบียนเลขที่ ๖-๐๐๓-๖-๐๐๑๒
 - ๒) นางสาวจุฑามาศ เจริญพรหม ทะเบียนเลขที่ ๖-๐๐๓-๖-๐๐๑๕
 - ๓) นางสาวณัฐนิช นนตานอก ทะเบียนเลขที่ ๖-๐๐๓-๖-๐๐๒๔
๓. ให้ยกเลิกขอบข่ายรายการสารมลพิษในน้ำเสีย และน้ำใต้ดินตามรายการเอกสารแนบท้ายหนังสือต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกสารที่ อภ ๐๓๒๐/๑๙๖๒ ลงวันที่ ๒๗ กรกฎาคม ๒๕๖๖ และนำได้คืน จำนวน ๑๑ รายการ รวมทั้งสิ้นจำนวน ๑๔๘ รายการ ตามเอกสารแนบท้ายหนังสือเปลี่ยนแปลงเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษ เปลี่ยนแปลงสารมลพิษในดิน และเปลี่ยนแปลงบุคลากร ดังสิ่งที่ส่งมาด้วย
๔. ให้วิเคราะห์สารมลพิษตามขอบข่ายที่ได้รับขึ้นทะเบียนให้วิเคราะห์เพิ่มเติมในดิน จำนวน ๑๒ รายการ ตามเอกสารแนบท้ายหนังสือเปลี่ยนแปลงเอกสารอ้างอิงวิธีวิเคราะห์สารมลพิษเปลี่ยนแปลงสารมลพิษในดิน และเปลี่ยนแปลงบุคลากร ดังสิ่งที่ส่งมาด้วย

อนึ่ง หนังสือ ...



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



อนึ่ง หนังสือฉบับนี้จะหมดอายุพร้อมหนังสือต่ออายุขึ้นทะเบียนห้องปฏิบัติการวิเคราะห์เอกสารในวันที่ ๕ กรกฎาคม ๒๕๖๙

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายพรพงศ์ กลั่นกรอง)
รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมโรงงานอุตสาหกรรม

ศูนย์วิจัยและเตือนภัยมลพิษโรงงานภาคตะวันออก
โทร. ๐ ๓๓๑๓ ๖๐๕๕ ต่อ ๕๐๐๑-๒
ไปรษณีย์อิเล็กทรอนิกส์ airw@diw.mail.go.th



“อุตสาหกรรมก้าวไกล ประเทศไทยก้าวหน้า ร่วมกันพัฒนา อุตสาหกรรมสีเขียว”



ขอขยายสารมลพิษที่ได้รับขึ้นทะเบียนจากกรมโรงงานอุตสาหกรรม จำนวน ๑๗๐ รายการ

น้ำเสีย จำนวน 47 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	Aldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
2	Arsenic	1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽¹⁾
3	Barium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
4	α -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
5	β -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
6	δ -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
7	γ -BHC	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
8	Biochemical Oxygen Demand	1) 5-Day BOD Test, Membrane Electrode Method ⁽¹⁾ 2) 5-Day BOD Test, Azide Modification Method ⁽¹⁾
9	Cadmium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
10	Chemical Oxygen Demand	Closed Reflux, Titrimetric Method ⁽¹⁾
11	cis-Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾

12 trans-Chlordane ...

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
12	trans-Chlordane	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
13	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽¹⁾
14	Color	ADMI Weighted-Ordinate Spectrophotometric Method ⁽¹⁾
15	Copper	1) Digestion, Direct Air-Acetylene Flame Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽¹⁾
16	Cyanide	Distillation, Colorimetric Method ⁽¹⁾
17	4,4'-DDD	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
18	4,4'-DDE	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
19	DDT	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
20	Dieldrin	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
21	Endosulfan I	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
22	Endosulfan II	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
23	Endosulfan sulfate	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
24	Endrin	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾

25 Endrin aldehyde ...

ลำดับ ที่	สารเคมี	วิธีวิเคราะห์
25	Endrin aldehyde	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
26	Endrin ketone	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
27	Formaldehyde	Distillation, Colorimetric Method ⁽⁴⁾
28	Free Chlorine	1) Iodometric Method ⁽¹⁾ 2) Colorimetric Method ⁽¹⁾
29	Heptachlor	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
30	Heptachlor Epoxide	1) Liquid-Liquid Extraction, Gas Chromatographic Method ⁽¹⁾ 2) Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
31	Hexavalent Chromium	Filtration, Colorimetric Method ⁽¹⁾
32	Lead	1) Digestion, Direct Air-Acetylene Flame Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽¹⁾
33	Manganese	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
34	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ⁽¹⁾
35	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic / Mass Spectrometric Method ⁽¹⁾
36	Nickel	1) Digestion, Direct Air-Acetylene Flame Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽¹⁾
37	Oil and Grease	Liquid-Liquid, Partition-Gravimetric Method ⁽¹⁾
38	pH	Electrometric Method ⁽¹⁾
39	Phenols	Distillation, Direct Photometric Method ⁽¹⁾
40	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ⁽¹⁾

ลำดับ ที่	สารเคมี	วิธีวิเคราะห์
41	Sulfide	ZnS Precipitation, Iodometric Method ⁽¹⁾
42	Temperature	Field Method ⁽¹⁾
43	Trivalent Chromium	1) Digestion, Direct Air-Acetylene Flame Method; Filtration, Colorimetric Method; Calculation ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method; Colorimetric Method; Calculation ⁽¹⁾
44	Total Dissolved Solids	Dried at 180 °C ⁽¹⁾
45	Total Kjeldahl Nitrogen	Macro Kjeldahl Method ⁽¹⁾
46	Total Suspended Solids	Dried at 103-105 °C ⁽¹⁾
47	Zinc	Digestion, Inductively Coupled Plasma Method ⁽¹⁾

น้ำใต้ดิน จำนวน 111 รายการ

ลำดับ ที่	สารเคมี	วิธีวิเคราะห์
1	Acenaphthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
2	Acetone	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
3	Aldrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
4	Anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
5	Antimony	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
6	Arsenic	1) Continuous Hydride Generation/Atomic Absorption Spectrometric Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽¹⁾
7	Barium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
8	Benz(a)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
9	Benzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
10	Benzo(b)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
11	Benzo(k)fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
12	Benzo(a)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
13	Benzo(g,h,i)perylene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
14	Beryllium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
15	Bis(2-chloroethyl)ether	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
16	Bis(2-ethylhexyl)phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
17	Bromodichloromethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
18	Bromoform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
19	Butanol	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
20	Butyl benzyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
21	Cadmium	Digestion, Inductively Coupled Plasma Method ⁽¹⁾
22	Carbazole	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
23	Carbon disulfide	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
24	Carbon tetrachloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾

25 Chlordane ...

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
25	Chlordane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
26	p-Chloroaniline	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
27	Chlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
28	Chlorodibromomethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
29	Chloroform	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
30	2-Chlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
31	Chromium	1) Digestion, Direct Air-Acetylene Flame Method ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method ⁽¹⁾
32	Chromium (III)	1) Digestion, Direct Air-Acetylene Flame Method; Filtration, Colorimetric Method; Calculation ⁽¹⁾ 2) Digestion, Inductively Coupled Plasma Method; Filtration, Colorimetric Method; Calculation ⁽¹⁾
33	Chromium (VI)	Filtration, Colorimetric Method ⁽¹⁾
34	Chrysene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
35	Cyanide	Distillation, Colorimetric Method ⁽¹⁾
36	DDD	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
37	DDE	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
38	DDT	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾
39	Dibenz(a,h)anthracene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ⁽¹⁾

40 Di-n-butyl phthalate ...

ลำดับ ที่	สารเคมี	วิธีวิเคราะห์
40	Di-n-butyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
41	1,2-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
42	1,3-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
43	1,4-Dichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
44	1,1-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
45	1,2-Dichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
46	1,1-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
47	cis-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
48	trans-1,2-Dichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
49	2,4-Dichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
50	1,2-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
51	1,3-Dichloropropane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
52	Dieldrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
53	Diethyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
54	2,4-Dimethylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]

ลำดับ ที่	สารเคมี	วิธีวิเคราะห์
55	2,4-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
56	2,6-Dinitrotoluene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
57	Di-n-octyl phthalate	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
58	Endosulfan	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
59	Endrin	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
60	Ethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
61	Fluoranthene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
62	Fluorene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
63	Heptachlor	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
64	Heptachlor epoxide	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
65	Hexachlorobenzene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
66	Hexachloro-1,3-butadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
67	n-Hexane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
68	α -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
69	β -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
70	γ -HCH	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
71	Hexachlorocyclopentadiene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
72	Hexachloroethane	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
73	Indeno(1,2,3-cd)pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
74	Isophorone	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
75	Lead	1) Digestion, Direct Air-Acetylene Flame Method ^[1] 2) Digestion, Inductively Coupled Plasma Method ^[1]
76	Manganese	Digestion, Inductively Coupled Plasma Method ^[1]
77	Mercury	Digestion, Cold-Vapor Atomic Absorption Spectrometric Method ^[1]
78	Methoxychlor	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
79	Methylene chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
80	2-Methylphenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
81	2-Methylnaphthalene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
82	Methyl tert-butyl ether	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
83	Naphthalene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]
84	Nickel	Digestion, Inductively Coupled Plasma Method ^[1]
85	Nitrobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[1]

86 N-Nitrosodi-n-propylamine ...

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
86	N-Nitrosodi-n-propylamine	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[1]
87	pH	Electrometric Method ^[4]
88	Phenanthrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
89	Phenol	1) Distillation, Direct Photometric Method ^[4] 2) Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
90	Pyrene	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
91	Selenium	Digestion, Hydride Generation/Atomic Absorption Spectrometric Method ^[4]
92	Silver	Digestion, Inductively Coupled Plasma Method ^[4]
93	Styrene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
94	1,1,2,2-Tetrachloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
95	Trichloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
96	1,2,4-Trichlorobenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
97	1,1,1-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
98	1,1,2-Trichloroethane	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
99	Tetrachloroethylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
100	Toluene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
101	2,4,5-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]

102 2,4,6-Trichlorophenol ...

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
102	2,4,6-Trichlorophenol	Liquid-Liquid Extraction, Gas Chromatographic/Mass Spectrometric Method ^[4]
103	1,3,5-Trimethylbenzene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
104	Vanadium	Digestion, Inductively Coupled Plasma Method ^[4]
105	Vinyl acetate	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
106	Vinyl chloride	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
107	m-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
108	o-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
109	p-Xylene	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
110	Xylene (Total)	Purge and Trap, Gas Chromatographic/Mass Spectrometric Method ^[4]
111	Zinc	Digestion, Inductively Coupled Plasma Method ^[4]

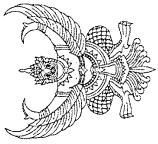
ดิน จำนวน 12 รายการ

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
1	α -HCH	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
2	β -HCH	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
3	γ -HCH	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
4	Heptachlor	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]

ลำดับ ที่	สารมลพิษ	วิธีวิเคราะห์
5	Aldrin	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
6	Heptachlor epoxide	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
7	Chlordane	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
8	Dieldrin	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
9	Endrin	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
10	DDD	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
11	DDT	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]
12	Methoxychlor	Ultrasonic Extraction, Gas Chromatographic/Mass Spectrometric Method ^[2,3]

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แบบ กภ.บญ
นิติบุคคล

กรมสวัสดิการและคุ้มครองแรงงาน
ใบอนุญาต
เป็นผู้ให้บริการตรวจวัดและวิเคราะห์สภาพการทำงานเกี่ยวกับระดับความร้อน

ใบอนุญาตเลขที่ ๐๔๐๑-๐๓-๒๕๖๔-๐๐๐๙

อนุญาตให้.....บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด.....
เลขทะเบียนนิติบุคคล ๐๒๐๕๕๓๕๐๔๕๗๕.....
ตั้งอยู่ เลขที่ ๔๔๔ หมู่ที่ ๑๑ ตำบลหนองขาม อำเภอสรีราชา จังหวัดชลบุรี.....
เป็นนิติบุคคลผู้ให้บริการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามกฎกระทรวง
กำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อม
ในการทำงานเกี่ยวกับความร้อน แสงสว่าง และเสียง พ.ศ. ๒๕๕๙ ในการตรวจวัดและวิเคราะห์
สภาพการทำงานเกี่ยวกับระดับความร้อน ประกอบกับกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการ
เพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ แห่งพระราชบัญญัติ
ความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๕๔ โดยมีบุคลากร จำนวน ๓ ราย

ตั้งแต่วันที่ ๓๐ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๒๙ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๓๐ ธันวาคม พ.ศ. ๒๕๖๔

(นายสมพจน์ กวางแก้ว)
ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากรแนบท้ายใบอนุญาต
เป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์สภาพการทำงานเกี่ยวกับระดับความร้อน
ของบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด
ใบอนุญาตเลขที่ ๐๔๐๑-๐๓-๒๕๖๔-๐๐๐๙

- นางวรรณเพ็ญ เหลาจิณศิริวัฒน์
- นางสาวธนพร กลิ่นสอย
- นายวัฒนา โคตรหล้า

ตั้งแต่วันที่ ๓๐ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๒๙ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๓๐ ธันวาคม พ.ศ. ๒๕๖๔

(นายสมพจน์ กวางแก้ว)
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อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากร (เพิ่มเติม)

แนบท้ายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์สถานะการทำงานเกี่ยวกับระดับความร้อน
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ใบอนุญาตเลขที่ ๐๔๐๑-๐๓-๒๕๖๔-๐๐๐๙

๑. นางสาวปนัดดา ร่มรุกษ์
๒. นางสาวอริสดี ชื่นอารมย์
๓. นางสาวจุฑามาศ เจริญพรหม
๔. นางสาววิมลดา จำปาศัน
๕. นางสาวณัฏฐิณณ์ ชันดี
๖. นางสาวจุฑารัตน์ สุขะเกต
๗. นางสาวศวิตา กิตติเนาวรัตน์
๘. นางสาวพรนภา พงษ์เพชร

ทั้งนี้ ตั้งแต่วันที่ ๑๗ มิถุนายน พ.ศ. ๒๕๖๔ ถึงวันที่ ๒๙ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๑๗ มิถุนายน พ.ศ. ๒๕๖๔



(นายสมพจน์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากร (เพิ่มเติม)

แนบท้ายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์สถานะการทำงานเกี่ยวกับระดับความร้อน
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ใบอนุญาตเลขที่ ๐๔๐๑-๐๓-๒๕๖๔-๐๐๐๙

๑. นางสาวอรอนงค์ ลิวศ์ศักดิ์
๒. นางสาวปาริชาติ สัมพันธ์
๓. นางสาวเสนา พาลี

ทั้งนี้ ตั้งแต่วันที่ ๑๗ กันยายน พ.ศ. ๒๕๖๖ ถึงวันที่ ๒๙ ธันวาคม พ.ศ. ๒๕๖๗

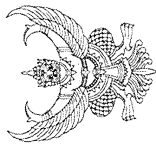
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(นายสมพจน์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน




แบบ ภ.บ.ญ
นิติบุคคล

กรมสวัสดิการและคุ้มครองแรงงาน
ใบอนุญาต
เป็นผู้ให้บริการตรวจวัดและวิเคราะห์สภาพการทำงานเกี่ยวกับระดับแสงสว่าง
ใบอนุญาตเลขที่ ๐๔๐๒-๐๓-๒๕๖๔-๐๐๐๙

อนุญาตให้ บริษัท อีสเทิร์น ไทย คอนสตรัคติง 1992 จำกัด
เลขทะเบียนนิติบุคคล ๐๒๐๕๕๓๕๐๔๕๗๘
ตั้งอยู่ เลขที่ ๙๙๙ หมู่ที่ ๑๑ ตำบลหนองขาม อำเภอศรีราชา จังหวัดชลบุรี
เป็นนิติบุคคลผู้ให้บริการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามกฎกระทรวง
กำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อม
ในการทำงานเกี่ยวกับความร้าว ส่องสว่าง และเสียง พ.ศ. ๒๕๕๙ ในการตรวจวัดและวิเคราะห์สภาพ
การทำงานเกี่ยวกับระดับแสงสว่าง ประกอบกับกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการ
เพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ แห่งพระราชบัญญัติ
ความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๕๔ โดยมีบุคลากร จำนวน ๓ ราย


ทั้งนี้ ตั้งแต่วันที่ ๓๐ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๒๙ ธันวาคม พ.ศ. ๒๕๖๗
ให้ไว้ ณ วันที่ ๓๐ ธันวาคม พ.ศ. ๒๕๖๔


(นายสมพงษ์ กวางแก้ว)
ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากรแนบท้ายใบอนุญาต
เป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์สภาพการทำงานเกี่ยวกับระดับแสงสว่าง
ของบริษัท อีสเทิร์น ไทย คอนสตรัคติง 1992 จำกัด
ใบอนุญาตเลขที่ ๐๔๐๒-๐๓-๒๕๖๔-๐๐๐๙

๑. นางวรรณเพ็ญ เหลาจินดาวัฒน์
 ๒. นางสาวธัญพร กลิ่นไธถม
 ๓. นายวัฒนา โคตรหล้า
- ทั้งนี้ ตั้งแต่วันที่ ๓๐ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๒๙ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๓๐ ธันวาคม พ.ศ. ๒๕๖๔


(นายสมพงษ์ กวางแก้ว)
ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากร (เพิ่มเติม)

แนบท้ายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์สถานะการทำงานเกี่ยวกับระดับแสงสว่าง
ของบริษัท อีสเทิร์น ไทย คอนสตรัคติง 1992 จำกัด

ใบอนุญาตเลขที่ ๐๔๐๒-๐๓-๒๕๖๔-๐๐๐๙

- | | |
|---------------------|---------------|
| ๑. นางสาวปนัดดา | รุ่งฤทธิ์ |
| ๒. นางสาวอริสรา | ชื่นอารมย์ |
| ๓. นางสาวจุฑามาศ | เจริญพรหม |
| ๔. นางสาววิมิดา | จำปาศัน |
| ๕. นางสาวอัญญลักษณ์ | ชินโต |
| ๖. นางสาวจุฑารัตน์ | สุขาเกต |
| ๗. นางสาวศวิดา | กิตติเมวรัตน์ |
| ๘. นางสาวพรนภา | พงษ์เพชร |
- ทั้งนี้ ตั้งแต่วันที่ ๑๗ มิถุนายน พ.ศ. ๒๕๖๔ ถึงวันที่ ๒๙ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๑๗ มิถุนายน พ.ศ. ๒๕๖๔


(นายสมพจน์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน


อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากร (เพิ่มเติม)

แนบท้ายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์สถานะการทำงานเกี่ยวกับระดับแสงสว่าง
ของบริษัท อีสเทิร์น ไทย คอนสตรัคติง 1992 จำกัด

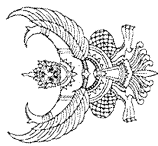
ใบอนุญาตเลขที่ ๐๔๐๒-๐๓-๒๕๖๔-๐๐๐๙

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|--------------------|------------|
| ๑. นางสาวอรอนงค์ | สิ่วศักดิ์ |
| ๒. นางสาวปารยากรณ์ | สังข์ทอง |
| ๓. นางสาวยศดา | พาลี |
- ทั้งนี้ ตั้งแต่วันที่ ๑๘ กันยายน พ.ศ. ๒๕๖๖ ถึงวันที่ ๒๙ ธันวาคม พ.ศ. ๒๕๖๗
- ให้ไว้ ณ วันที่ ๑๘ กันยายน พ.ศ. ๒๕๖๖


(นายสมพจน์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน



แบบ กภ.บญ
บัญชี

กรมสวัสดิการและคุ้มครองแรงงาน
ใบอนุญาต
เป็นผู้ให้บริการตรวจวัดและวิเคราะห์สภาพการทำงานเกี่ยวกับระดับเสียง
ใบอนุญาตเลขที่ ๐๔๐๓-๐๓-๒๕๖๔-๐๐๐๙

อนุญาตให้ บัญชี อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด
เลขทะเบียนนิติบุคคล..๐๒๐๕๕๓๕๐๐๕๕๓๕๔.....
ตั้งอยู่ เลขที่ ๙๙๙ หมู่ที่ ๑๑ ตำบลหนองขาม อำเภอสหัสขันธ์ จังหวัดกาฬสินธุ์
เป็นนิติบุคคลผู้ให้บริการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามกฎหมาย
กำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อม
ในการทำงานเกี่ยวกับความร้อน แสงสว่าง และเสียง พ.ศ. ๒๕๕๙ ในการตรวจวัดและวิเคราะห์สภาพการทำงาน
เกี่ยวกับระดับเสียง ประกอบกับกฎกระทรวงกำหนดขั้นตอนและวิธีการอนุญาตให้บริการ เพื่อส่งเสริมความปลอดภัย
อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ แห่งพระราชบัญญัติความปลอดภัย อาชีวอนามัย
และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๕๔ โดยมีบุคลากร จำนวน ๓ ราย

ตั้ง ตั้งแต่วันที่ ๓๐ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๒๙ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๓๐ ธันวาคม พ.ศ. ๒๕๖๔

(นายสมพงษ์ กวางแก้ว)
ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากรแนบท้ายใบอนุญาต
เป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์สภาพการทำงานเกี่ยวกับระดับเสียง
ของบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด
ใบอนุญาตเลขที่ ๐๔๐๓-๐๓-๒๕๖๔-๐๐๐๙

๑. นางวรรณเพ็ญ เหลาจินดาวัฒน์
 ๒. นางสาวธนัชพร กลิ่นโสมณ
 ๓. นายวัฒนา โคตรหล้า
- ทั้งนี้ ตั้งแต่วันที่ ๓๐ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๒๙ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๓๐ ธันวาคม พ.ศ. ๒๕๖๔

(นายสมพงษ์ กวางแก้ว)
ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากร (เพิ่มเติม)

แนบท้ายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์สถานะการทำงานเกี่ยวกับระดับเสียง
ของบริษัท อีสเทิร์น ไทย คอนสตรัคติง 1992 จำกัด

ใบอนุญาตเลขที่ ๐๔๐๓-๐๓-๒๕๖๔-๐๐๐๙

- | | |
|--------------------|---------------|
| ๑. นางสาวปนัดดา | ร่มรุข |
| ๒. นางสาวอริส | ชื่นอารมย์ |
| ๓. นางสาวจุฑามาศ | เจริญพรหม |
| ๔. นางสาววินิดา | จำปาตัน |
| ๕. นางสาวธัญลักษณ์ | ชินโต |
| ๖. นางสาวจุฑารัตน์ | สุชาภาด |
| ๗. นางสาวศวีดา | กิตติเมวรัตน์ |
| ๘. นางสาวพรณา | พงษ์เพชร |

ทั้งนี้ ตั้งแต่วันที่ ๑๗ มิถุนายน พ.ศ. ๒๕๖๔ ถึงวันที่ ๒๙ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๑๗ มิถุนายน พ.ศ. ๒๕๖๔



(นายสมพจน์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากร (เพิ่มเติม)

แนบท้ายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์สถานะการทำงานเกี่ยวกับระดับเสียง
ของบริษัท อีสเทิร์น ไทย คอนสตรัคติง 1992 จำกัด

ใบอนุญาตเลขที่ ๐๔๐๓-๐๓-๒๕๖๔-๐๐๐๙

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|--------------------|-------------|
| ๑. นางสาวอรอนงค์ | สิงค์ศักดิ์ |
| ๒. นางสาวไปรยาภรณ์ | สิงห์ทอง |
| ๓. นางสาวยลดา | พาลี |

ทั้งนี้ ตั้งแต่วันที่ ๑๘ กันยายน พ.ศ. ๒๕๖๖ ถึงวันที่ ๒๙ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๑๘ กันยายน พ.ศ. ๒๕๖๖



(นายสมพจน์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

ที่ รง ๐๕๐๔/๕๗๑๒



กรมสวัสดิการและคุ้มครองแรงงาน
ถนนมิตรไมตรี ดินแดง กรุงเทพฯ ๑๐๕๐๐

๑๓ มิถุนายน ๒๕๖๕

เรื่อง การอนุมัติเพิ่มเติมบุคลากรและเครื่องมือตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับความรุนแรง
แสงสว่าง และเสียง

เรียน กรรมการผู้จัดการบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด

อ้างถึง หนังสือบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ที่ อทคตว. ๑๖๕/๒๕๖๕ และ อทคตว. ๑๖๖/๒๕๖๕
ลงวันที่ ๒๕ กุมภาพันธ์ ๒๕๖๕

สิ่งที่ส่งมาด้วย ๑. รายชื่อบุคลากร (เพิ่มเติม) แบบท้ายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์
สภาวะการทำงานเกี่ยวกับระดับความรุนแรง แสงสว่าง และเสียง จำนวน ๓ ฉบับ

๒. รายการเครื่องมือตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับเสียง (เพิ่มเติม)
จำนวน ๑ ฉบับ

ตามหนังสือที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ได้ขออนุมัติเพิ่มเติม
บุคลากรผู้ดำเนินการตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับความรุนแรง แสงสว่าง และเสียง
จำนวน ๘ ราย พร้อมเครื่องมือตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับเสียง จำนวน ๑๘ เครื่อง
สำหรับการเป็นผู้ให้บริการตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับความรุนแรง แสงสว่าง และเสียง
ตามกฎหมายกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อม
ในการทำงาน พ.ศ. ๒๕๖๔ ความละเอียดแจ้งแล้ว นั้น

กรมสวัสดิการและคุ้มครองแรงงาน ได้พิจารณาแล้วเห็นว่าบุคลากรและเครื่องมือตรวจวัด
และวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับความรุนแรงและเสียง ของบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด
ที่ขออนุมัติเพิ่มเติม มีคุณสมบัติตามกฎกระทรวงกำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการ
ด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงานเกี่ยวกับระดับความรุนแรง แสงสว่าง และเสียง
พ.ศ. ๒๕๕๙ ประกอบประกาศกรมสวัสดิการและคุ้มครองแรงงาน เรื่อง หลักเกณฑ์ วิธีการตรวจวัด และการวิเคราะห์
สภาวะการทำงานเกี่ยวกับระดับความรุนแรง แสงสว่าง หรือเสียง รวมทั้งระยะเวลาและประเภทกิจการที่ต้องดำเนินการ
ลงวันที่ ๘ กุมภาพันธ์ พ.ศ. ๒๕๖๑ จึงอนุมัติให้ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด เพิ่มเติมบุคลากร
และเครื่องมือตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับเสียงดังกล่าว รายละเอียดปรากฏตามสิ่งที่ส่งมาด้วย
ทั้งนี้ ขอให้บริษัทฯ ปฏิบัติตามกฎหมายกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัย
อย่างเคร่งครัด

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายสมพจน์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

กองความปลอดภัยแรงงาน

โทรศัพท์ ๐ ๒๔๔๘ ๕๑๒๘ - ๓๙ ต่อ ๗๐๒

โทรสาร ๐ ๒๔๔๘ ๕๑๔๓

ที่ รง ๐๕๐๔/๓๑๕



กรมสวัสดิการและคุ้มครองแรงงาน
ถนนมิตรไมตรี ดินแดง กรุงเทพฯ ๑๐๕๐๐

๑๓ มกราคม ๒๕๖๖

เรื่อง การอนุมัติเพิ่มเติมเครื่องมือตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับความรุนแรง และเสียง
เรียน กรรมการผู้จัดการบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด

อ้างถึง หนังสือบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ที่ อทคตว. 872/2565 ลงวันที่ ๕ สิงหาคม ๒๕๖๕
สิ่งที่ส่งมาด้วย รายการเครื่องมือตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับความรุนแรง และเสียง (เพิ่มเติม)
จำนวน ๒ ฉบับ

ตามหนังสือที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ได้ขออนุมัติเพิ่มเติม
เครื่องมือตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับความรุนแรง และเสียง จำนวน ๒๘ เครื่อง สำหรับ
การเป็นผู้ให้บริการตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับความรุนแรง แสงสว่าง และเสียง
ตามกฎหมายกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย
และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ ความละเอียดแจ้งแล้ว นั้น

กรมสวัสดิการและคุ้มครองแรงงาน ได้พิจารณาแล้วเห็นว่าเครื่องมือตรวจวัดและวิเคราะห์
ผลการปฏิบัติงานเกี่ยวกับระดับความรุนแรง และเสียง ของบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด
ที่ขออนุมัติเพิ่มเติม มีคุณสมบัติตามกฎกระทรวงกำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการ
ด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงานเกี่ยวกับความรุนแรง แสงสว่าง และเสียง พ.ศ. ๒๕๕๙
ประกอบกับประกาศกรมสวัสดิการและคุ้มครองแรงงาน เรื่อง หลักเกณฑ์ วิธีการตรวจวัด และการวิเคราะห์สภาวะ
การทำงานเกี่ยวกับระดับความรุนแรง แสงสว่าง หรือเสียง รวมทั้งระยะเวลาและประเภทกิจการที่ต้องดำเนินการ
ลงวันที่ ๘ กุมภาพันธ์ พ.ศ. ๒๕๖๑ และที่แก้ไขเพิ่มเติม จึงอนุมัติให้ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด
เพิ่มเติมเครื่องมือตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับความรุนแรง และเสียง ดังกล่าว รายละเอียด
ปรากฏตามสิ่งที่ส่งมาด้วย ทั้งนี้ ขอให้บริษัทฯ ปฏิบัติตามกฎหมายกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการ
เพื่อส่งเสริมความปลอดภัยอย่างเคร่งครัด

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายสมพจน์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

กองความปลอดภัยแรงงาน

โทรศัพท์ ๐ ๒๔๔๘ ๕๑๒๘ - ๓๙ ต่อ ๗๐๕

โทรสาร ๐ ๒๔๔๘ ๕๑๔๓

ที่ รง ๐๕๐๔/๑๖๑๐



กรมสวัสดิการและคุ้มครองแรงงาน
ถนนมิตรไมตรี ดินแดง กรุงเทพฯ ๑๐๕๐๐
๑๖ กันยายน ๒๕๖๖

เรื่อง การอนุมัติเพิ่มเติมบุคลากรและเครื่องมือตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับความร้อน
แสงสว่าง และเสียง

เรียน กรรมการผู้จัดการบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด

อ้างถึง หนังสือบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ที่ อทค.ว. ๑๐๖๐/๒๕๖๖ ลงวันที่ ๑๗ สิงหาคม ๒๕๖๖
สิ่งที่ส่งมาด้วย ๑. รายชื่อบุคลากร (เพิ่มเติม) แบบทนายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์

สภาวะการทำงานเกี่ยวกับระดับความร้อน ลงวันที่ ๑๗ กันยายน พ.ศ. ๒๕๖๖ จำนวน ๑ ฉบับ

๒. รายชื่อบุคลากร (เพิ่มเติม) แบบทนายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์

สภาวะการทำงานเกี่ยวกับระดับแสงสว่าง ลงวันที่ ๑๗ กันยายน พ.ศ. ๒๕๖๖ จำนวน ๑ ฉบับ

๓. รายชื่อบุคลากร (เพิ่มเติม) แบบทนายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดและวิเคราะห์

สภาวะการทำงานเกี่ยวกับระดับเสียง ลงวันที่ ๑๗ กันยายน พ.ศ. ๒๕๖๖ จำนวน ๑ ฉบับ

๔. รายการเครื่องมือตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับเสียง (เพิ่มเติม) ลงวันที่

๑๗ กันยายน พ.ศ. ๒๕๖๖ จำนวน ๑ ฉบับ

ตามหนังสือที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ได้ขออนุมัติเพิ่มเติมบุคลากร
ผู้ดำเนินการตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับความร้อน แสงสว่าง และเสียง จำนวน ๓ ราย
และเครื่องมือตรวจวัด รวมจำนวน ๒ เครื่อง สำหรับการใช้ให้บริการตรวจวัดและวิเคราะห์ผลการปฏิบัติงาน
เกี่ยวกับระดับความร้อน แสงสว่าง และเสียง ตามกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริม
ความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ เพื่อให้กรมสวัสดิการและคุ้มครองแรงงาน
พิจารณา ความละเอียดแจ้งแล้ว นั้น

กรมสวัสดิการและคุ้มครองแรงงาน ได้พิจารณาแล้วเห็นว่าบุคลากรและเครื่องมือตรวจวัดและวิเคราะห์
สภาวะการทำงานเกี่ยวกับระดับความร้อน แสงสว่าง และเสียง ที่ขออนุมัติเพิ่มเติม มีคุณสมบัติตามกฎกระทรวงกำหนด
มาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน
เกี่ยวกับความร้อน แสงสว่าง และเสียง พ.ศ. ๒๕๕๙ ประกอบกับประกาศกรมสวัสดิการและคุ้มครองแรงงาน
เรื่อง หลักเกณฑ์ วิธีการตรวจวัด และการวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับความร้อน แสงสว่าง หรือเสียง
รวมทั้งระยะเวลาและประเภทกิจการที่ต้องดำเนินการ ลงวันที่ ๘ กุมภาพันธ์ พ.ศ. ๒๕๖๑ และที่แก้ไขเพิ่มเติม
จึงอนุมัติให้ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด เพิ่มเติมบุคลากรและเครื่องมือตรวจวัดดังกล่าว
รายละเอียดปรากฏตามสิ่งที่ส่งมาด้วย ทั้งนี้ ขอให้ปฏิบัติตามกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการ
เพื่อส่งเสริมความปลอดภัยฯ อย่างเคร่งครัด

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายสมพงษ์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

กองความปลอดภัยแรงงาน
โทรศัพท์ ๐ ๒๔๔๘ ๙๒๒๘ - ๓๙ ต่อ ๗๐๒
โทรสาร ๐ ๒๔๔๘ ๙๓๔๓

ที่ รง ๐๕๐๔/๑๖๑๐



กรมสวัสดิการและคุ้มครองแรงงาน
ถนนมิตรไมตรี ดินแดง กรุงเทพฯ ๑๐๕๐๐

๑๕ พฤศจิกายน ๒๕๖๖

เรื่อง การอนุมัติเพิ่มเติมเครื่องมือตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับแสงสว่าง

เรียน กรรมการผู้จัดการบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด

อ้างถึง หนังสือบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ที่ อทค.ว. ๑๔๘๐/๒๕๖๖ ลงวันที่ ๑๖ ตุลาคม ๒๕๖๖
สิ่งที่ส่งมาด้วย รายการเครื่องมือตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับแสงสว่าง (เพิ่มเติม) ลงวันที่

๑๕ พฤศจิกายน พ.ศ. ๒๕๖๖ จำนวน ๑ ฉบับ

ตามหนังสือที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ได้ขออนุมัติเพิ่มเติมเครื่องมือ
ตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับแสงสว่าง รวมจำนวน ๒ เครื่อง สำหรับการใช้ให้บริการ
ตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับแสงสว่าง ตามกฎกระทรวงการขึ้นทะเบียนและการอนุญาต
ให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ เพื่อให้กรมสวัสดิการ
และคุ้มครองแรงงานพิจารณา ความละเอียดแจ้งแล้ว นั้น

กรมสวัสดิการและคุ้มครองแรงงาน ได้พิจารณาแล้วเห็นว่าเครื่องมือตรวจวัดและวิเคราะห์สภาวะ
การทำงานเกี่ยวกับระดับแสงสว่าง ที่ขออนุมัติเพิ่มเติม มีคุณสมบัติตามกฎกระทรวงกำหนดมาตรฐานในการบริหาร
จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงานเกี่ยวกับความร้อน แสงสว่าง
และเสียง พ.ศ. ๒๕๕๙ ประกอบกับประกาศกรมสวัสดิการและคุ้มครองแรงงาน เรื่อง หลักเกณฑ์ วิธีการตรวจวัด
และการวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับความร้อน แสงสว่าง หรือเสียง รวมทั้งระยะเวลาและประเภท
กิจการที่ต้องดำเนินการ ลงวันที่ ๘ กุมภาพันธ์ พ.ศ. ๒๕๖๑ และที่แก้ไขเพิ่มเติม จึงอนุมัติให้ บริษัท อีสเทิร์น ไทย
คอนซัลติ้ง 1992 จำกัด เพิ่มเติมเครื่องมือตรวจวัดและวิเคราะห์ผลการปฏิบัติงานเกี่ยวกับระดับแสงสว่างดังกล่าว
รายละเอียดปรากฏตามสิ่งที่ส่งมาด้วย ทั้งนี้ ขอให้ปฏิบัติตามกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการ
เพื่อส่งเสริมความปลอดภัยฯ อย่างเคร่งครัด

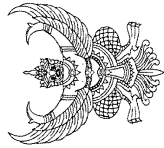
จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายสมพงษ์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

กองความปลอดภัยแรงงาน
โทรศัพท์ ๐ ๒๔๔๘ ๙๒๒๘ - ๓๙ ต่อ ๗๐๒
โทรสาร ๐ ๒๔๔๘ ๙๓๔๓



แบบ กบ.บญ
นิติบุคคล

กรมสวัสดิการและคุ้มครองแรงงาน

ใบอนุญาต

เป็นผู้ให้บริการตรวจวัดความเข้มข้นของสารเคมีอันตราย
ในบรรยากาศของสถานที่ทำงาน และสถานที่เก็บรักษาสารเคมีอันตราย

ใบอนุญาตเลขที่ ๐๒๐๑-๐๓-๒๕๖๕-๐๐๐๘

อนุญาตให้... บริษัท อีสเทิร์น ไทย คอนสตรัคติง 1992 จำกัด

เลขทะเบียนนิติบุคคล... ๐๒๐๕๕๓๕๐๐๔๕๗๘

ตั้งอยู่... เลขที่ ๙๙๙ หมู่ที่ ๑๑ ตำบลหนองขาม อำเภอศรีราชา จังหวัดชลบุรี

เป็นนิติบุคคลผู้ให้บริการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามกฎหมายกำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงานเกี่ยวกับสารเคมีอันตราย พ.ศ. ๒๕๕๖ ในการเป็นผู้ให้บริการตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงาน และสถานที่เก็บรักษาสารเคมีอันตราย ประกอบกับกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ แห่งพระราชบัญญัติความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๕๔ โดยมีบุคลากร จำนวน ๑๖ ราย

ทั้งนี้ ตั้งแต่วันที่ ๒๗ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๒๖ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๒๗ ธันวาคม พ.ศ. ๒๕๖๔

(นายสมพจน์ กวางแก้ว)

ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากรแบบท้ายใบอนุญาต
เป็นนิติบุคคลผู้ให้บริการตรวจวัดความเข้มข้นของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงาน
และสถานที่เก็บรักษาสารเคมีอันตราย

ของ บริษัท อีสเทิร์น ไทย คอนสตรัคติง 1992 จำกัด

ใบอนุญาตเลขที่ ๐๒๐๑-๐๓-๒๕๖๕-๐๐๐๘

- | | |
|------------------|----------------|
| ๑. นางวรรณเพ็ญ | เหลาจินดาวัฒน์ |
| ๒. นางสาวธนัชพร | กลินโลณ |
| ๓. นายวัฒนา | โคตรหล้า |
| ๔. นายลงไทย | บุญศักดิ์ |
| ๕. นายวิษณุชวลิต | สิงโต |
| ๖. นายโอชา | ขวัญศิริมงคล |
| ๗. นายธีระพงษ์ | นวลอินทร์ |
| ๘. นายวรการ | ไวทยะเสวี |
| ๙. นายนิชพล | ทองหล่อ |
| ๑๐. นายสุทธา | สงธณีนัย |
| ๑๑. นายธรรมรัตน์ | โพธิ์ตันคำ |
| ๑๒. นายเมธี | สุขประเสริฐ |
| ๑๓. นายคมฤกษ์ | ครรสอน |
| ๑๔. นายวรวิทย์ | สงวนศิลป์ |
| ๑๕. นายวีระชัย | พอใจ |
| ๑๖. นางสาวจริยา | ยาตรี |

ทั้งนี้ ตั้งแต่วันที่ ๒๗ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๒๖ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๒๗ ธันวาคม พ.ศ. ๒๕๖๔

(นายสมพจน์ กวางแก้ว)

ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากร (เพิ่มเติม)

แนบท้ายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศ

ของสถานที่ทำงานและสถานที่เก็บรักษาสารเคมีอันตราย

ของบริษัท อีสเทิร์น ไทย คอมมัลติคิง 1992 จำกัด

ใบอนุญาตเลขที่ ๐๒๐๑-๐๓-๒๕๖๔-๐๐๐๘

๑. นางสาวนันประภา อุตสุนัน
๒. นางสาวจันทนี สายพันธ์
๓. นายทรงพล ผิวอ้วน
๔. นายศุภฤกษ์ พาดกลาง
๕. นางสาวอรรณณ นียม
๖. นางสาววินิดา จำปาดัน
๗. นางสาวพรนภา พงษ์เพชร
๘. นางสาวจุฑารัตน์ สุขษาเกิด
๙. นางสาวศรिता กิตติเนาวรัตน์

ทั้งนี้ ตั้งแต่วันที่ ๒๓ กุมภาพันธ์ พ.ศ. ๒๕๖๖ ถึงวันที่ ๒๖ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๒๓ กุมภาพันธ์ พ.ศ. ๒๕๖๖



(นายสมพงษ์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากร (เพิ่มเติม)

แนบท้ายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศ

ของสถานที่ทำงานและสถานที่เก็บรักษาสารเคมีอันตราย

ของบริษัท อีสเทิร์น ไทย คอมมัลติคิง 1992 จำกัด

ใบอนุญาตเลขที่ ๐๒๐๑-๐๓-๒๕๖๔-๐๐๐๘

๑. นางสาวอรอนงค์ สิวศ์ศักดิ์
๒. นางสาวไพบารณ์ สังข์ทอง
๓. นางสาวยลดา พาลี
๔. นางสาวปภาดา เจริญพร
๕. นายวรวิธ อารีย์เอื้อ
๖. นายศุภกร นพพรพิทักษ์

ทั้งนี้ ตั้งแต่วันที่ ๑๙ กันยายน พ.ศ. ๒๕๖๖ ถึงวันที่ ๒๖ ธันวาคม พ.ศ. ๒๕๖๗

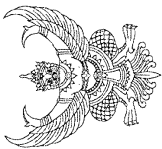
ให้ไว้ ณ วันที่ ๑๙ กันยายน พ.ศ. ๒๕๖๖



(นายสมพงษ์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน



แบบ กภ.บญ
นิติบุคคล

กรมสวัสดิการและคุ้มครองแรงงาน

ใบอนุญาต

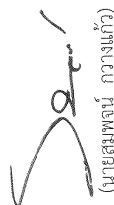
เพื่อให้บริการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตราย
ในบรรยากาศของสถานที่ทำงาน และสถานที่ที่เก็บรักษาสารเคมีอันตราย

ใบอนุญาตเลขที่ ๑๒๐๒-๐๓-๒๕๖๔-๐๐๐๕

อนุญาตให้.....บริษัท อีสเทิร์น ไทย คอนสตรัคชั่น จำกัด.....
เลขทะเบียนนิติบุคคล.....๑๒๐๕๕๕๐๐๔๕๗๕.....
ตั้งอยู่เลขที่ ๓๕๕ หมู่ที่ ๑๑ ตำบลหนองขาม อำเภอศรีราชา จังหวัดชลบุรี.....
เป็นนิติบุคคลผู้ให้บริการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน ตามกฎกระทรวง
กำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อม
ในการทำงานเกี่ยวกับสารเคมีอันตราย พ.ศ. ๒๕๖๒ ในการเป็นผู้ใช้บริการวิเคราะห์ระดับความเข้มข้น
ของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงาน และสถานที่ที่เก็บรักษาสารเคมีอันตราย ประกอบกับ
กฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อม
ในการทำงาน พ.ศ. ๒๕๖๔ แห่งพระราชบัญญัติความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน
พ.ศ. ๒๕๕๔ โดยมีบุคลากร จำนวน ๙ ราย

ตั้งแต่วันที่ ๒๗ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๒๗ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๒๗ ธันวาคม พ.ศ. ๒๕๖๔


(นายสมพงษ์ กวางแก้ว)

ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากรแนบท้ายใบอนุญาต
เป็นนิติบุคคลผู้ให้บริการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงาน
และสถานที่ที่เก็บรักษาสารเคมีอันตราย

ของ บริษัท อีสเทิร์น ไทย คอนสตรัคชั่น 1992 จำกัด

ใบอนุญาตเลขที่ ๐๒๐๒-๐๓-๒๕๖๔-๐๐๐๕

๑. นายกะวีร์	สุทธทรัพย์
๒. นางสาวนันท์ณภัส	แบขุนทด
๓. นางสาวกัลณัท	ป้อมน้อย
๔. นางสาวอังศรี	จิตตะโคตร
๕. นางสาววรรณภา	ไชยศิริ
๖. นางสาวพรพิมล	ภูมิคอนสาร
๗. นางสาวธมลวรรณ	ผลอ้อ
๘. นายภาณุพงศ์	บำรุงรส
๙. นางสาวอัครสุดา	มงคลโกทน

ตั้งแต่วันที่ ๒๗ ธันวาคม พ.ศ. ๒๕๖๔ ถึงวันที่ ๒๗ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๒๗ ธันวาคม พ.ศ. ๒๕๖๔



(นายสมพงษ์ กวางแก้ว)

ผู้ตรวจราชการกรม ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

รายชื่อบุคลากร (เพิ่มเติม)

แบบท้ายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศ

ของสถานที่ทำงานและสถานที่เก็บรักษาสารเคมีอันตราย

ของบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด

ใบอนุญาตเลขที่ ๐๒๐๒-๐๓-๒๕๖๔-๐๐๕

๑. นางสาวอภิรดี
๒. นางสาวจิรพร
๓. นายชานูวัฒน์
๔. นางสาวพจณีย์
๕. นางสาวบุญเรือง
๖. นางสาวอาภาภรณ์
๗. นางสาวสรสร
๘. นางสาวพรณิทิพย์
๙. นางสาวภาณิน
๑๐. นางสาวสุนิษา
๑๑. นางสาวรัชฎีลักษณ์
๑๒. นางสาวรัฐดี
๑๓. นางสาวระพีนา
๑๔. นางสาวสุทธิดา
๑๕. นางสาวสุมิลตรา
๑๖. นางสาวอรษา
๑๗. นายกิตติ
๑๘. นายชาญณรงค์
๑๙. นางสาวดวงกมล
๒๐. นางสาวคณัญญา
๒๑. นางสาววิชราภรณ์

ทั้งนี้ ตั้งแต่วันที่ ๒๗ กุมภาพันธ์ พ.ศ. ๒๕๖๖ ถึงวันที่ ๒๖ ธันวาคม พ.ศ. ๒๕๖๗

ให้ไว้ ณ วันที่ ๒๗ กุมภาพันธ์ พ.ศ. ๒๕๖๖



(นายสมพงษ์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน



ที่ รง ๐๕๐๔/๒๒๐

กรมสวัสดิการและคุ้มครองแรงงาน
ถนนมิตรไมตรี ดินแดง กรุงเทพฯ ๑๐๕๐๐

๒๗ กุมภาพันธ์ ๒๕๖๖

เรื่อง การอนุมัติเพิ่มเติมบุคลากรผู้ดำเนินการตรวจวัดและวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตราย
เรียน กรรมการผู้ปฏิบัติการบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด
อ้างถึง หนังสือบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ที่ อทคตว. ๘๗๑/๒๕๖๕ ลงวันที่ ๕ สิงหาคม ๒๕๖๕
สิ่งที่ส่งมาด้วย ๑. รายชื่อบุคลากร (เพิ่มเติม) แบบท้ายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัด
ระดับความเข้มข้นของสารเคมีอันตรายฯ จำนวน ๑ ฉบับ
๒. รายชื่อบุคลากร (เพิ่มเติม) แบบท้ายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการวิเคราะห์
ระดับความเข้มข้นของสารเคมีอันตรายฯ จำนวน ๑ ฉบับ

ตามหนังสือที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ได้ขออนุมัติเพิ่มเติม
บุคลากรผู้ดำเนินการตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายฯ จำนวน ๙ ราย และบุคลากร
ผู้ดำเนินการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายฯ จำนวน ๒๑ ราย สำหรับเป็นผู้ให้บริการ
ตรวจวัดและวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายฯ ตามกฎกระทรวงการขึ้นทะเบียน
และการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔
ความละเอียดแจ้งแล้ว นั้น

กรมสวัสดิการและคุ้มครองแรงงาน ได้พิจารณาแล้วเห็นว่าบุคลากรผู้ดำเนินการตรวจวัด
และวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายฯ ของบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด
ที่ขออนุมัติเพิ่มเติมเป็นไปตามกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัยฯ
ประกอบกับกฎกระทรวงกำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย
และสภาพแวดล้อมในการทำงานเกี่ยวกับสารเคมีอันตราย พ.ศ. ๒๕๕๖ จึงอนุมัติให้ บริษัท อีสเทิร์น ไทย
คอนซัลติ้ง 1992 จำกัด เพิ่มเติมบุคลากรผู้ดำเนินการตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายฯ จำนวน ๒๑ ราย ดังกล่าว
๙ ราย และบุคลากรผู้ดำเนินการวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายฯ จำนวน ๒๑ ราย ดังกล่าว
รายละเอียดปรากฏตามสิ่งที่ส่งมาด้วย ทั้งนี้ ขอให้บริษัทฯ ปฏิบัติตามกฎหมายกระทรวงการขึ้นทะเบียนและการอนุญาต
ให้บริการเพื่อส่งเสริมความปลอดภัยฯ อย่างเคร่งครัด

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ



(นายสมพงษ์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน

อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

กองความปลอดภัยแรงงาน
โทรศัพท์ ๐ ๒๕๔๘ ๔๒๒๔ - ๓๙ ต่อ ๗๐๓
โทรสาร ๐ ๒๕๔๘ ๔๑๔๓



ที่ รง ๐๕๐๔/๓๕๕๓

กรมสวัสดิการและคุ้มครองแรงงาน
ถนนมิตรไมตรี ดินแดง กรุงเทพฯ ๑๐๕๐๐

๖๓

กันยายน ๒๕๖๖

เรื่อง การอนุมัติเพิ่มเติมบุคลากรตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายในบรรยากาศของสถานที่ทำงาน และสถานที่เก็บรักษาสารเคมีอันตราย และเครื่องมือวิเคราะห์ความเข้มข้นของสารเคมีอันตรายฯ

เรียน กรรมการผู้จัดการบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด

อ้างถึง หนังสือบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ที่ อทคดว. ๑๐๓๗/๒๕๖๖ ลงวันที่ ๑๓ สิงหาคม ๒๕๖๖
สิ่งที่ส่งมาด้วย ๑. รายชื่อบุคลากร (เพิ่มเติม) แนบท้ายใบอนุญาตเป็นนิติบุคคลผู้ให้บริการตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายฯ ลงวันที่ ๒๙ กันยายน พ.ศ. ๒๕๖๖ จำนวน ๑ ฉบับ
๒. รายการเครื่องมือวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายฯ (เพิ่มเติม) ลงวันที่ ๑๙ กันยายน พ.ศ. ๒๕๖๖ จำนวน ๑ ฉบับ

ตามหนังสือที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ได้ขออนุมัติเพิ่มเติมบุคลากรตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายฯ จำนวน ๖ ราย และเครื่องมือวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายฯ จำนวน ๕ เครื่อง สำหรับการเป็นผู้ให้บริการตรวจวัดและวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายฯ ตามกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ ความละเอียดแล้ว นั้น

กรมสวัสดิการและคุ้มครองแรงงาน ได้พิจารณาแล้วเห็นว่าบุคลากรตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายฯ และเครื่องมือวิเคราะห์ความเข้มข้นของสารเคมีอันตรายฯ ของบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ที่ขออนุมัติเพิ่มเติมเป็นไปตามกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ และกฎกระทรวงกำหนดมาตรฐานในการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงานเกี่ยวกับสารเคมีอันตราย พ.ศ. ๒๕๕๖ ประกอบกับประกาศกรมสวัสดิการและคุ้มครองแรงงาน เรื่อง หลักเกณฑ์ วิธีการตรวจวัด และการวิเคราะห์ผลการตรวจวัดระดับความเข้มข้นของสารเคมีอันตราย จึงอนุมัติให้ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด เพิ่มเติมบุคลากรตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายฯ และเครื่องมือวิเคราะห์ระดับความเข้มข้นของสารเคมีอันตรายฯ ดังกล่าว รายละเอียดปรากฏตามสิ่งที่ส่งมาด้วย ทั้งนี้ ขอให้บริษัทฯ ปฏิบัติตามกฎหมายกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัยฯ อย่างเคร่งครัด

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายสมพงษ์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

กองความปลอดภัยแรงงาน

โทรศัพท์ ๐ ๒๔๔๘ ๕๑๒๘ - ๓๙ ต่อ ๗๐๓

โทรสาร ๐ ๒๔๔๘ ๕๑๓๓



ที่ รง ๐๕๐๔/๓๐๕๓

กรมสวัสดิการและคุ้มครองแรงงาน
ถนนมิตรไมตรี ดินแดง กรุงเทพฯ ๑๐๕๐๐

๓๓

มีนาคม ๒๕๖๖

เรื่อง การอนุมัติเพิ่มเติมเครื่องมือตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายฯ

เรียน กรรมการผู้จัดการบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด

อ้างถึง หนังสือบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ที่ อทคดว. ๘๗๑/๒๕๖๕ ลงวันที่ ๕ สิงหาคม ๒๕๖๕
สิ่งที่ส่งมาด้วย รายการเครื่องมือตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายฯ (เพิ่มเติม) จำนวน ๑ ฉบับ

ตามหนังสือที่อ้างถึง บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ได้ขออนุมัติเพิ่มเติมเครื่องมือตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายฯ สำหรับการเป็นผู้ให้บริการตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายฯ ตามกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงาน พ.ศ. ๒๕๖๔ ความละเอียดแล้ว นั้น

กรมสวัสดิการและคุ้มครองแรงงาน ได้พิจารณาแล้วเห็นว่าบุคลากรผู้ดำเนินการตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายฯ ของบริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด ที่ขออนุมัติเพิ่มเติมเป็นไปตามกฎกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการทำงานเกี่ยวกับการบริหาร จัดการ และดำเนินการด้านความปลอดภัย อาชีวอนามัย และสภาพแวดล้อมในการเกี่ยวกัสารเคมีอันตราย พ.ศ. ๒๕๕๖ จึงอนุมัติให้ บริษัท อีสเทิร์น ไทย คอนซัลติ้ง 1992 จำกัด เพิ่มเติมเครื่องมือตรวจวัดระดับความเข้มข้นของสารเคมีอันตรายฯ ดังกล่าว รายละเอียดปรากฏตามสิ่งที่ส่งมาด้วย ทั้งนี้ ขอให้บริษัทฯ ปฏิบัติตามกฎหมายกระทรวงการขึ้นทะเบียนและการอนุญาตให้บริการเพื่อส่งเสริมความปลอดภัยฯ อย่างเคร่งครัด

จึงเรียนมาเพื่อทราบ

ขอแสดงความนับถือ

(นายสมพงษ์ กวางแก้ว)

รองอธิบดี ปฏิบัติราชการแทน
อธิบดีกรมสวัสดิการและคุ้มครองแรงงาน

กองความปลอดภัยแรงงาน

โทรศัพท์ ๐ ๒๔๔๘ ๕๑๒๘ - ๓๙ ต่อ ๗๐๓

โทรสาร ๐ ๒๔๔๘ ๕๑๓๓